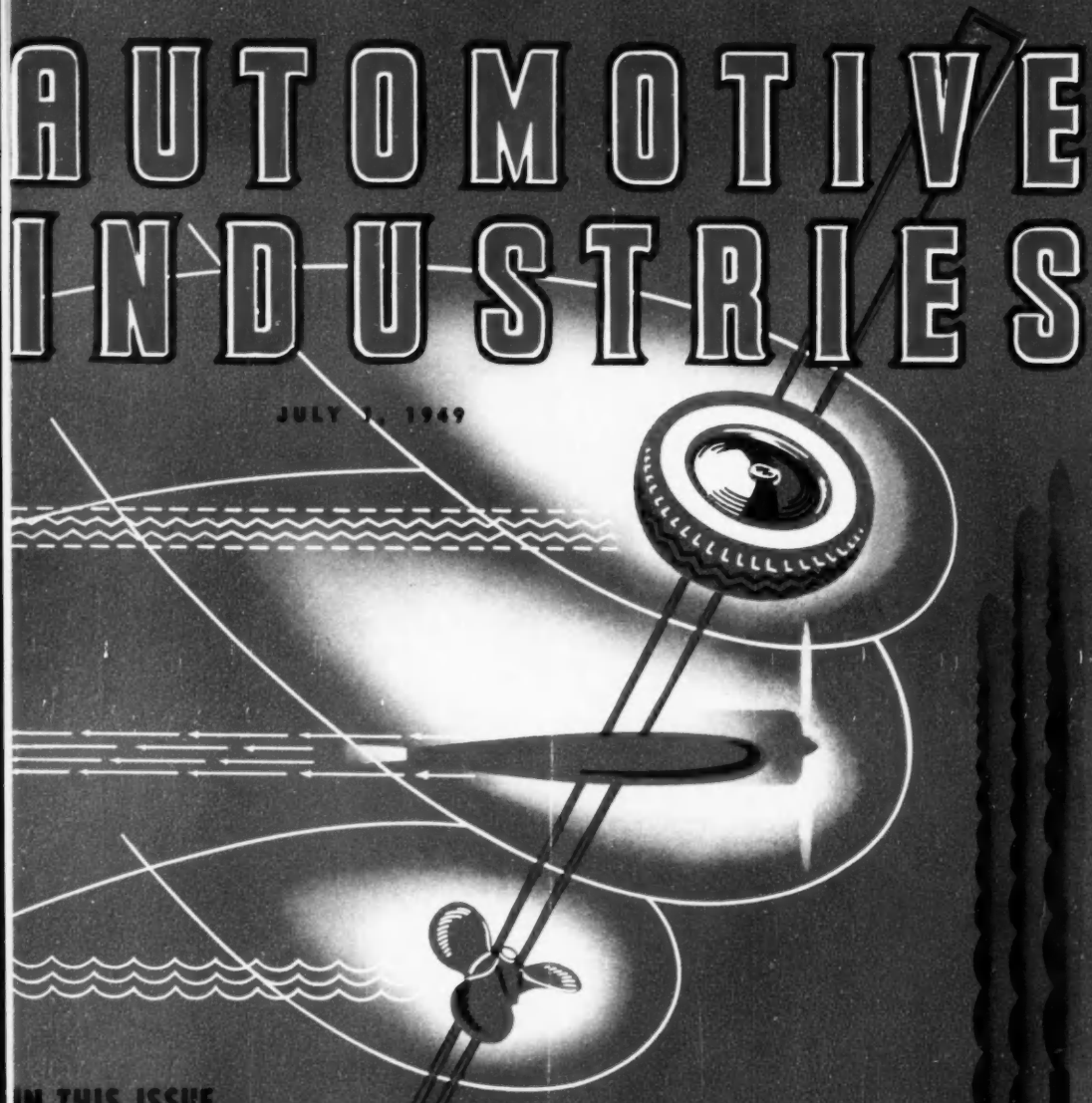
AUTOMOTIVE INDUSTRIES

JULY 1, 1949



IN THIS ISSUE

Roo's New Gold Comet Valve-in-Head Engine
High Compression Without High Octane Fuel
Major Features of Swedish 1950 Lightweight Car
Eaton's Latest Practices in Making Rear Axles
Engineering Highlights of SAE Summer Meeting

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A CHILTON PUBLICATION

● Shown above are several of the many different parts produced in stamping operations by the Streicher Die & Tool Co., Ypsilanti, Michigan. This company has made important savings by standardizing on Stanostamp C Compound for all of the plant's stamping jobs.

How to lick a stamping problem

THE REMOVAL of stamping compound from finished parts proved extra troublesome to the Streicher Die & Tool Co., Ypsilanti, Michigan. The problem was put to a Standard Oil Lubrication Engineer.

At his suggestion, stamping operations were switched to Stanostamp C Compound. This product formed stable emulsions, was easily removed from finished parts. To this saving of time and labor, Stanostamp C added still another economy . . .

Company expansion brought a greater variety of stamping jobs. Operators found that they could handle all of the various jobs with Stanostamp C simply by varying the concentration of compound-water mixtures. The versatility of Stanostamp C eliminated the cost and inconvenience of stocking special die lubricants.

Why not utilize the Standard Oil service employed so successfully by the Streicher Company? The combination of expert engineering and high-quality products can help you solve a specific problem or gain worthwhile savings. Write for this service, today.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Stanostamp Compounds

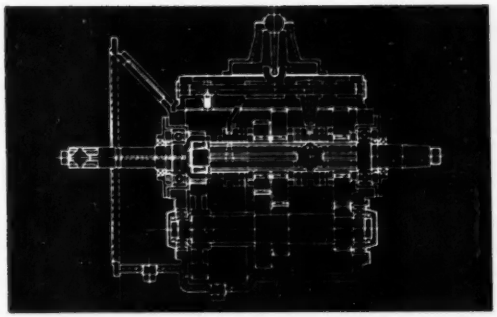
STANDARD OIL COMPANY (INDIANA)

STANDARD

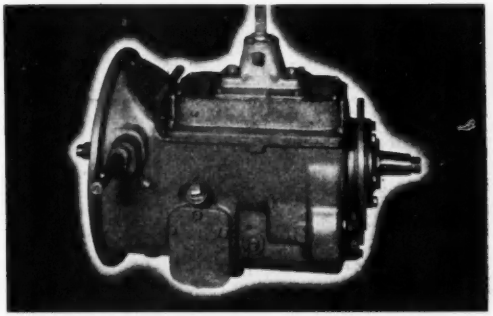
Engineered TO ORDER

FOR LOGGING YARDER MADE BY

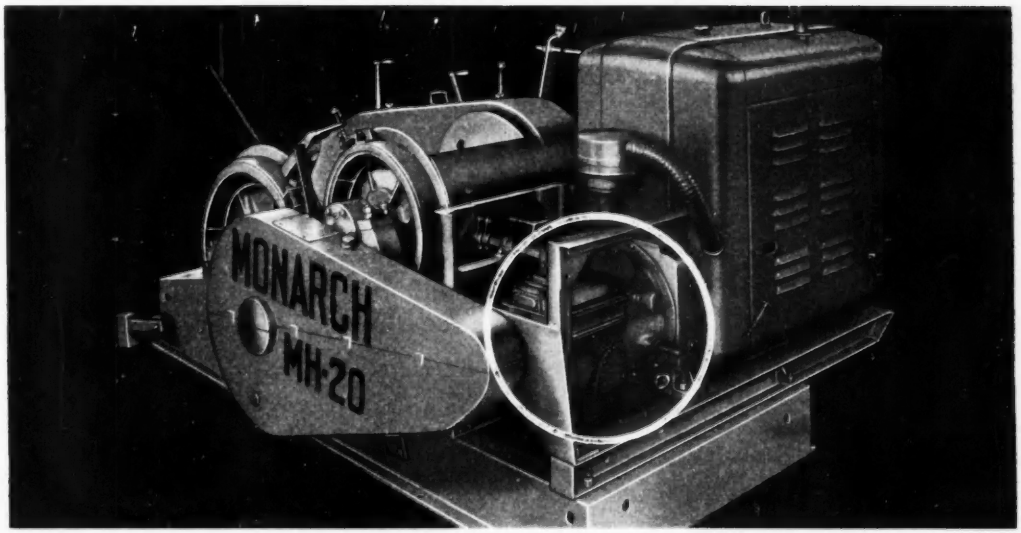
MONARCH FORGE & MACHINE WORKS, PORTLAND, OREGON



Engineered to order: transmission is constant-mesh, selective type, with helical gears. Compact unit to fit available space . . . precision-built in every detail. Economical in operation.



Four forward speeds range from low speed, high torque (to set log in motion) to 1.4 to 1 ratio (to quicken handling of rolling weight). Owner saves time and money every hour.



For rugged logging: yarder made by Monarch Forge & Machine Works, Portland, Oregon. Designed for heavy going, with minimum risk of breakdown far from source of repair parts. Requires a transmission that can "take it" . . . and COTTA does! Another achievement in COTTA's list of custom-designed power transmission units for heavy-duty applications. Write for illustrated brochure . . . today!

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An Assurance of Dependable Service

COTTA

HEAVY-DUTY

TRANSMISSIONS

PRECISION-BUILT • SPECIALLY ENGINEERED FOR YOUR PRODUCT

WHAT'S THE

Important Difference

BETWEEN

Carbon Steels and Alloy Steels?

No SINGLE characteristic denotes the real difference between alloy steels and carbon steels.

Certain of the most useful mechanical properties—strength, hardness, toughness, ductility—can be developed to a high degree, individually *but not collectively* in carbon steels.

Nor can such desirable characteristics as response to mild quenching, high strength and elastic properties in large sections, and good resistance to distortion and cracking in heat treatment of complex shapes be developed in carbon steels.

In nickel alloy steels *all* of these characteristics can be obtained, in greater or lesser degree, *at the same time*. From among the many grades of standard alloy steels containing nickel it is possible to select one which provides the best set of properties for meeting virtually any reasonable requirements.

Yes, in the final analysis, it is the better, more complete *combination* of properties—and, therefore, better performance and long-range economy—available in the nickel alloy steels which constitutes the most significant difference.

We shall be glad to furnish counsel and data to help you select the right nickel alloy steel for your requirements.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

July 1, 1949 Vol. 101, No. 1

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Specially Engineered . . . Line Produced

Young stamped tank and side member type sheet metal radiator. Used on power units, tractors, automobiles, trucks and similar installations.

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Plant facilities, production skill, and engineering experience combine at Young to mass produce radiators with custom-built quality. Such primary considerations as: care in original design to insure proper mounting support for most rigorous service, careful design of tools for accurate fitting of all components, and latest equipment and techniques, add up to maximum efficiency at minimum initial cost. Young offers the advantage of two decades' specialized experience and recently enlarged production facilities to design and manufacture the proper heat transfer equipment to meet your requirements.

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HEAT TRANSFER PRODUCTS

T. M. REG. U. S. PAT. OFF.

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General Offices: Dept. 109-G, Racine, Wisconsin

Plants at Racine, Wisconsin, and Mattoon, Illinois

AUTOMOTIVE PRODUCTS

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Get these results— plus lower costs— by using Texaco cutting coolants

YOUR plant may be working one metal or a dozen . . . using one method of machining or many — but whatever your production set-up, you can depend on *Texaco Cutting, Grinding and Soluble Oils* to increase your output, give you improved finish, reduce rejects and cut costs.

Texaco Cutting, Grinding and Soluble Oils provide thorough lubrication and protection both for work and tool. They keep them *cool*, preventing chip welding or wheel loading. They assure more cuts per tool grind and longer tool life. Work is turned out faster, cleaner, and with smoother finish, saving you production time and materials.

A Texaco Lubrication Engineer who specializes in cutting coolants will gladly help you select — and advise you how to use — the Texaco cutting coolants you need to get peak machining efficiency.

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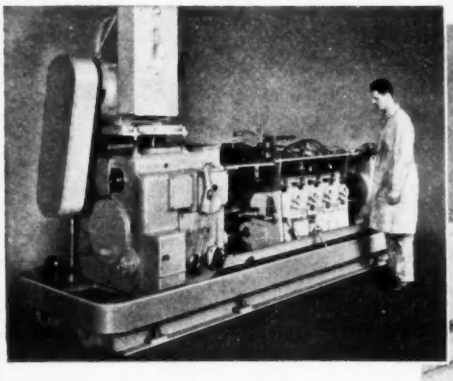
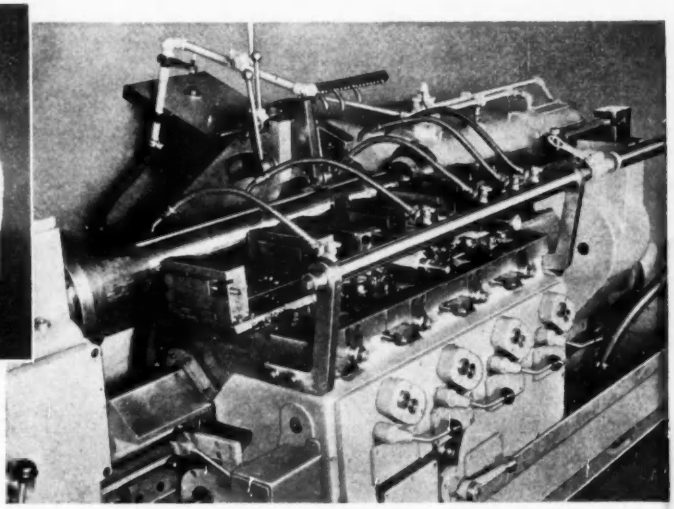
TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

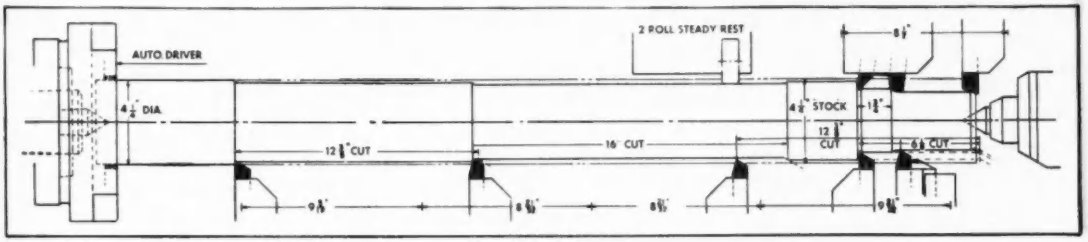
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





MODEL "AP" Lo-swing LATHE MACHINES HEAVY SPINDLES



Problem: To rough turn, square and chamfer large spindles produced in small and medium quantities.

Solution: The new Model "AP" Lo-swing Semi-Automatic Lathe was selected for this job for several reasons. A large variety of work was to be put on the machine, hence change-over time had to be minimized. Also, overlapping of cuts was not permitted on the relief-turned diameter and the long cuts possible with Model "AP" solved this problem.

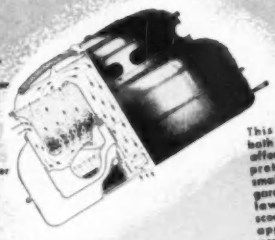
Turning is accomplished with five tools mounted on four independently-controlled, power-operated cross slides on the front carriage. Carriage can be rapid traversed to and from cutting position. Squaring and chamfering tools are mounted on the cam-operated, Back Squaring Attachment, which is automatically controlled and requires no attention by the operator. A hinged-type, two-roll Steady Rest prevents the work from springing away from the turning tools.

Because of its rugged construction throughout, Model "AP" is able to take full advantage of the tremendous cutting capacity of modern sintered carbide tools at high cutting speeds and coarse feeds. Investigate the many unique features of this new, semi-automatic lathe whose longitudinal carriage travel is limited only by its bed length.

Write for Bulletin AP-49.

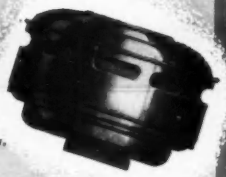
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



New style combination oil bath cleaner and silencer designed for use on down draft carburetors where head room is not available for conventional type combination cleaner and silencer.

This United oil bath air cleaner affords real dust protection for small engines used on garden tractors, power lawn mowers, motor scooters and many other applications of such power units.



Popular style of oil bath air cleaner used on trucks where cleaner is mounted directly on air horn of down draft carburetor.

Tractors, combines and other agricultural gasoline engines are protected by this standard type United oil bath air cleaner.

UNITED SPECIALTIES PRODUCTS

GEARED TO THE SWIFT MOVING AUTOMOTIVE WORLD

From the days of crude pioneer automobiles to the smooth lines of 1949, United Specialties Company has kept its products in step with automotive's ever-changing developments.

Today, in United's Air Cleaner Division, oil bath air cleaners are built for every type of internal combustion engine, including diesels. Millions of car, bus, truck and tractor engines are protected by these efficient cleaners.

The semi-automatic Directional Signal Switch — a notable contribution to safer driving, is a product of United's Mitchell Division. Another Mitchell product, the durable, highly regarded Mitchell ignition switch, has long been standard original equipment on popular makes of cars and trucks.

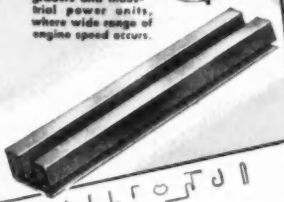
In addition Mitchell makes a complete range of rolled shapes in a variety of designs and gauges — cold-rolled, drawn and pressed.

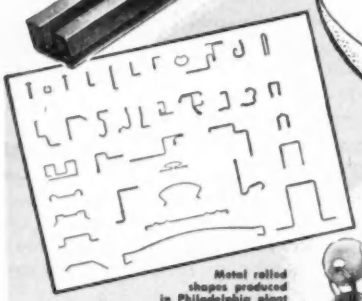
UNITED SPECIALTIES COMPANY

United Air Cleaner Division, Chicago 28 • Mitchell Division, Philadelphia 36

AIR CLEANERS ★ METAL STAMPINGS ROLLED SHAPES ★ IGNITION AND DIRECTIONAL SIGNAL SWITCHES ★ DOVETAILS

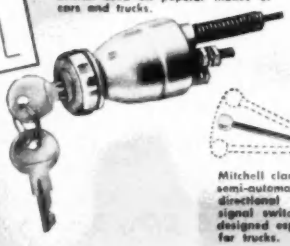
This United oil bath air cleaner is designed especially to protect Diesel engines in truck, tractor, graders and industrial power units, where wide range of engine speed occurs.

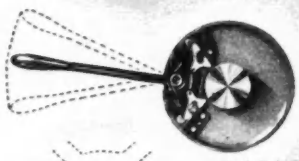




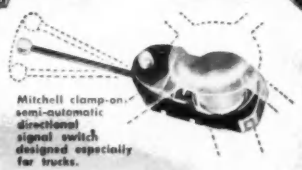
Metal rolled shapes produced in Philadelphia plant — complete range of metals, designs, gauges, stainless steel, aluminum, brass, bronze, copper, cold rolled, drawn and pressed for automobiles, airplanes, architectural requirements, railroad cars, radios, all industrial uses.

Conventional type Mitchell ignition switch used on popular makes of cars and trucks.



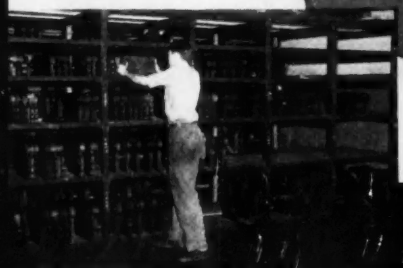


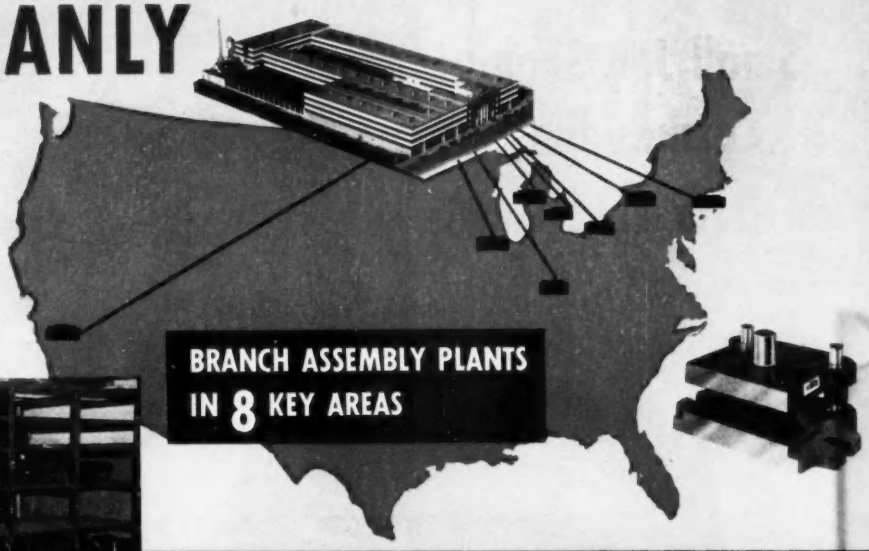
Mitchell built-in type semi-automatic directional signal switch used in passenger cars.



Mitchell clamp-on semi-automatic directional signal switch designed especially for trucks.

Why You Get FASTER SERVICE *from* DANLY





Any Standard Die Set Is Available at Your Nearest Branch Assembly Plant.

Complete stocks of all types and sizes of Danly Die Sets are carried in Danly's eight branch-plants.

Call on the Danly Branch Nearest You.

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Rochester 4, 16 Commercial Street
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Philadelphia 44, 18 West Chelten Avenue

Write for *free* bulletin

This bulletin contains helpful information and shows how you can use Danly's machining service for "extra" operations on your die set that will save you time and money in the long run.

TAKE ADVANTAGE of Danly's faster service. The die set you order is immediately assembled at a nearby Danly Branch Plant from complete stocks on hand. Save time—simply consult our catalog and place your order with the nearest Danly Branch. Shipment will be prompt.

Precision manufacture at Danly's main plant permits complete interchangeability of die set components. These parts, stocked at each branch, can be assembled into the thousands of possible combinations listed in the Danly catalog. Located in principal die making centers, each Danly branch can make any standard die set immediately available to you.

For prompt service on your next die set order, write, phone or wire "Danly."

NOW—Steel Plate in Stock

Steel stores of plate 1" to 8½" thick permit immediate manufacture of any size special all-steel die set or bolster plate made to your specification.

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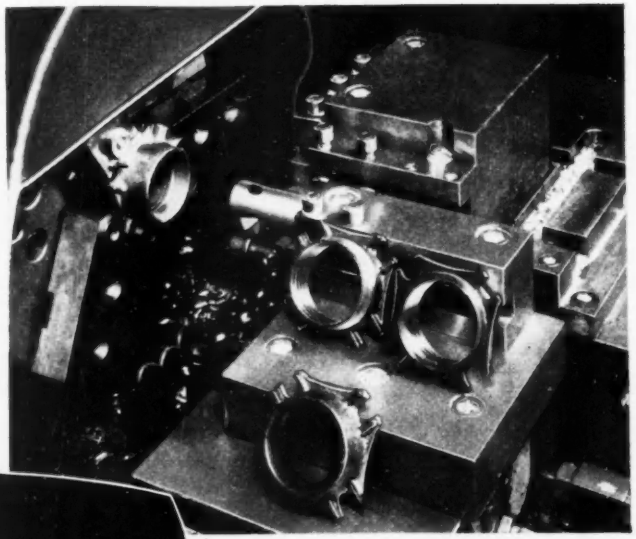
DANLY

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

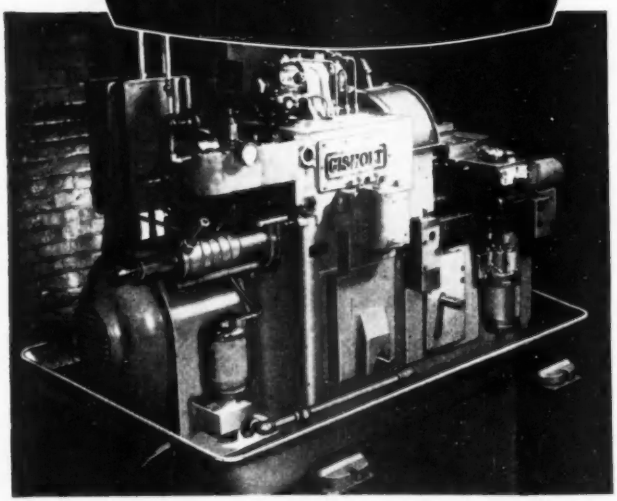
PRECISION DIE SETS . . . STANDARD AND SPECIAL

Small Job Shop Catches the BIG IDEA



cuts costs with—

GISHOLT No. 12 HYDRAULIC AUTOMATIC LATHE



No matter whether the shop is large or small . . . if there's volume, there's the opportunity to make money faster with automatic machining.

The Kilbourn Engineering Company of Milwaukee saw it—and proved it again—subcontracting these parts for electric hot water heaters with the Gisholt No. 12 Hydraulic.

Greater Production

With its fast automatic cycle and multiple cutting, the Gisholt turns out these parts at twice the rate of the previous method. A man merely loads and unloads the machine. The owner is not limited to this one job either. It is easily set up to handle a variety of work up to 12" in diameter.

Corner for Profit

Such work can be highly profitable for job shops. Especially when the whole operation can be tucked into one small corner of the shop as this one is.

Progressive thinking like this is what makes many small shops grow into big ones. Gisholt engineers can help you with all kinds of ideas for making the most of machine tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MECHANICAL HANDLING SYSTEMS, INC.

REDUCES TRAILER WEIGHT 22%

with J&L OTISCOLOY

HI-TENSILE STEEL SHEETS

J&L STEEL

Automobile-transport trailer under construction at Mechanical Handling Systems, Inc., Detroit, Mich. The J&L OTISCOLOY high-strength steel-sheet parts are easily formed and joined.

The high-strength steel trailer ready to get underway. Each automobile is safely cradled on OTISCOLOY sheet-steel tracks.

High-strength steel cuts ton-mile costs for operators of huge automobile transport trailers.

Maximum structural strength, rigidity and fatigue resistance are essential in huge automobile carrier trailers like those built by Mechanical Handling Systems, Inc., of Detroit, Mich. But these characteristics must be obtained with the very minimum of dead weight. Therefore high-strength steel is used almost entirely.

In the trailer illustrated, the use of J&L OTISCOLOY sheet helps to reduce dead weight from 9,000 lbs. to 7,000 lbs.—*a saving of 1 TON, or 22%!*

In many structures, the use of J&L OTISCOLOY reduces dead weight *as much as 35%* without loss of strength, because:

J&L OTISCOLOY

—Has twice the yield strength of mild steel

—Has 50% greater fatigue resistance than carbon steel

—Is resistant to abrasion

—Resists atmospheric corrosion 6 times better than carbon steel

J&L OTISCOLOY can be worked by any standard metal-working method . . . formed hot or cold . . . welded . . . flame-cut. Its ability to hold paint and resist corrosion further widens its applications.

Let us send you a copy of: "OTISCOLOY High-Tensile Steel." Mail the coupon today.

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Jones & Laughlin Steel Corporation
430 Jones & Laughlin Building
Pittsburgh 19, Pa.

Please send me at once a copy of your booklet: "OTISCOLOY High-Tensile Steel."

NAME_____

COMPANY_____

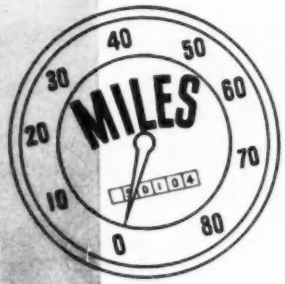
ADDRESS_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

For Heavy-Duty Carburetion that Delivers MORE



Per Dollar....

Zenith

is the Engineers' Choice!

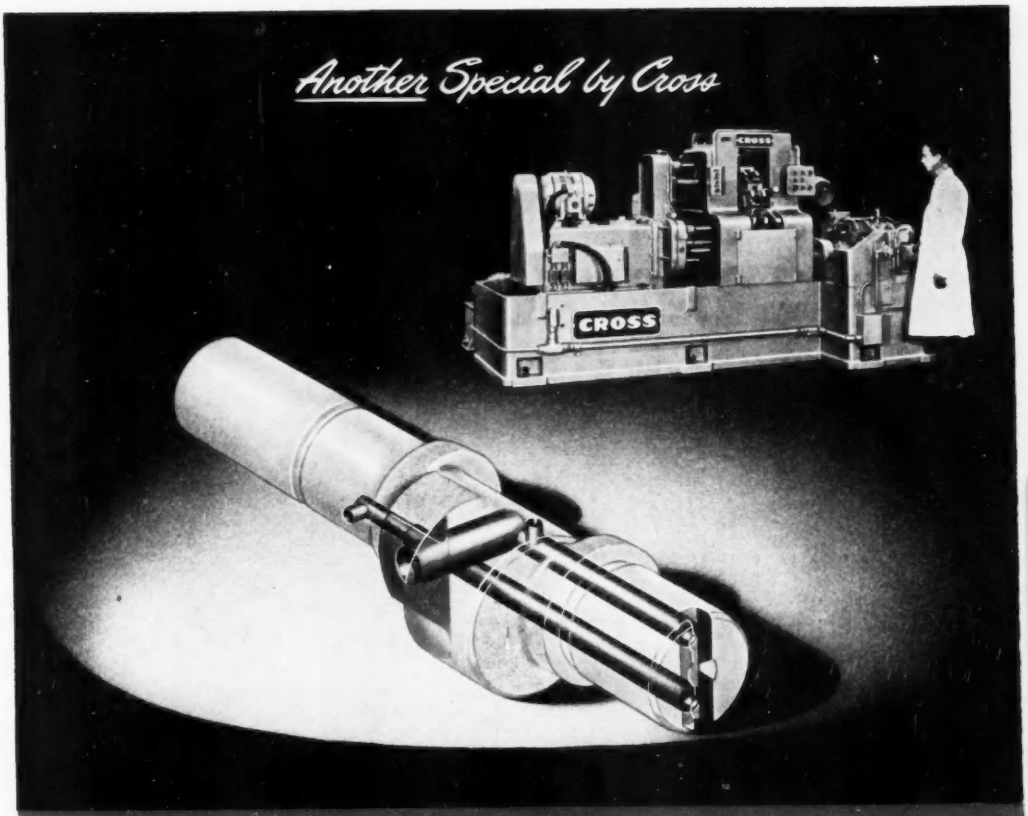
Today's competitive conditions make operating economy a must for the successful truck operator. The position of Zenith as leader in the field of heavy-duty carburetion has been achieved largely on Zenith's ability to deliver consistently good performance and economical fuel mileage. For more miles per dollar, for more years of service, specify Zenith—the engineers' choice for low cost, highest quality performance.

ZENITH CARBURETOR DIVISION OF Bendix AVIATION CORPORATION

696 Hart Avenue • Detroit 14, Michigan

MANUFACTURERS OF FINE CARBURETORS AND FUEL FILTERS

Another Special by Cross



Drills and *Mills* Refrigerator Crankshafts at *Less Cost* per Piece

- ★ 145 pieces finished per hour at 100% efficiency
- ★ 12 station automatic index trunnion for drilling five holes
- ★ Two deep oil holes drilled progressively—one in three stations and the other in six stations
- ★ Two milling operations performed by automatic unit independently of drilling

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Within its extensive organization Ex-Cell-O has exceptionally complete and modern facilities for machining, heat treating, sub-assembly and inspection, in addition to an engineering staff widely experienced and ready to serve you in solving your parts problems. Ex-Cell-O's manufacturing skill represents the most improved methods for producing your parts—from rough stock to finished piece. Ex-Cell-O, with all these facilities under one roof and one responsible management, offers many economical advantages. To get the best in quality and economy in parts, why not send a part print to Ex-Cell-O in Detroit? Write today.
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The quick success of push button controlled, hydraulically operated window lifts indicates definitely that this fundamental advancement in driving convenience will be extended to a number of other mechanisms in cars of tomorrow.

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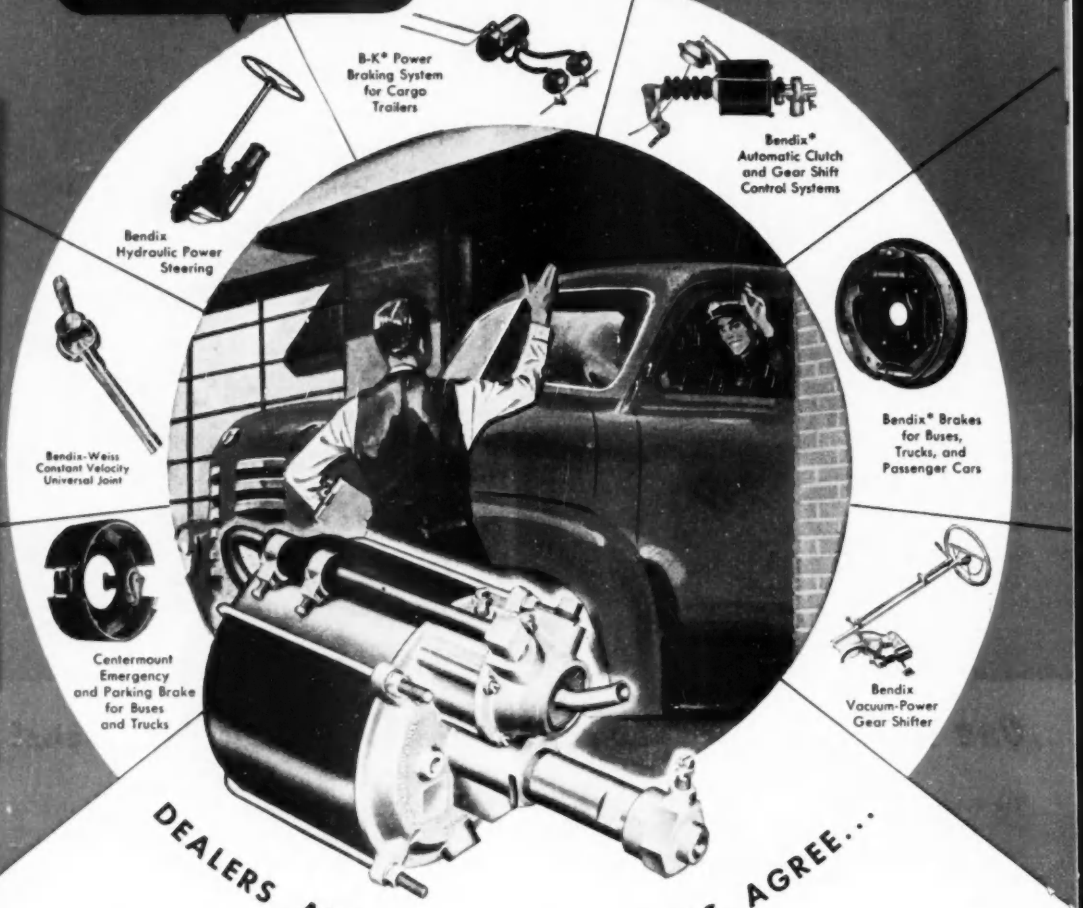
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AUTOMOTIVE INDUSTRIES

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

Latest Practices in Making Rear Axles

Recent improvements at Eaton Mfg. Company's Axle Division in Cleveland are highlighted in this account by Detroit Editor Joseph Geschelin. Modern transfer machines, automatic lathes, loading devices and a huge broach for internal gears are among the interesting pieces of equipment discussed. See page 24.

High Compression Without High Octane Fuel—Part I

A special series of four timely articles starts with this issue in response to tremendous interest in development of high compression engines respecting mechanical and chemical octane numbers. Part I points out advantages of petroleum conservation through use of a larger proportion of the crude, and describes several high compression engines operating on low octane fuel. Part I is found on page 28.

Swedish Aircraft Builder to Introduce Lightweight Car in 1950

Called the Saab-92, this small two-door four-passenger model with integral body and frame construction is a product of the Svenska Aeroplan Aktiebolaget in Linkoping. Of interest is its front wheel drive with engine placed transversely in front of and parallel to the front suspension. Further unusual disclosures are made in this special report, page 32.

Reo's New Gold Comet Engine and E-22 Truck Series

Designed to power the company's new E-22 truck series, the Reo new Gold Comet engine will comprise three gasoline models of 331, 292, and 255 cu. in. displacement. Engine designing and body styling are comprehensively reviewed, beginning on page 34.

SAE Analyzes Latest Engineering Developments

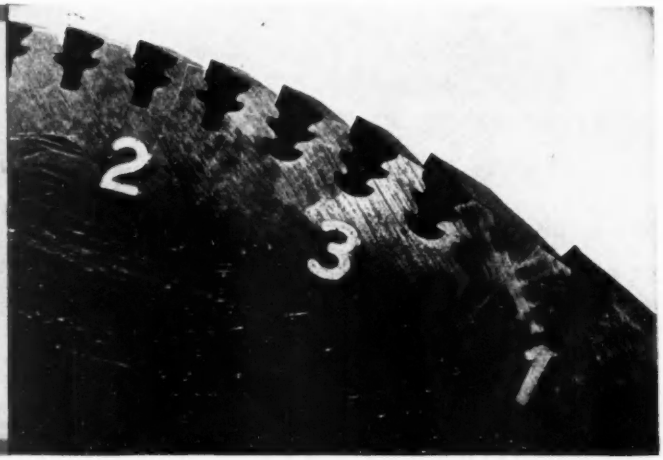
Largest summer meeting in SAE history, held at French Lick, Ind., in June, saw as a major feature presentation of papers on latest developments in compound engines and automatic transmissions. In this article the majority of the 15 papers read at the technical sessions are succinctly abstracted, pages 38 to 44 inclusive.

18 New Product Items And Other High Spots, Such As:

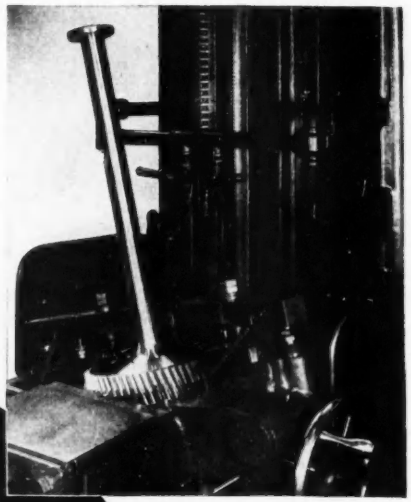
Federal Motor Company's two series of Diesel powered trucks; a high capacity fuel pump having six valves; and facts and figures on why premium gasoline is required by a large percentage of cars, based on a number of oil company surveys.

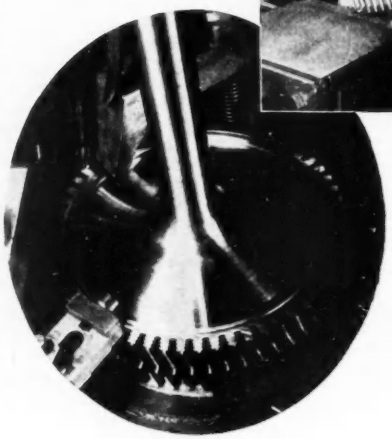
News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

How to Broach "Christmas Tree" Slots IN JET ENGINE ROTORS



The latest equipment developed by Cincinnati Engineers for broaching Christmas tree slots is illustrated here. The machine is a CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach. In this setup the broach holders are equipped with three rows of inserts, to finish the slots in three cuts. Upon completion of a downward stroke of the ram, the table retracts, the work holding fixture automatically unclamps, indexes to the next slot, and reclamps. After the ram has returned to the starting position, the table advances to cutting position and the cycle repeats. ¶ The photograph directly above shows the sequence of operations. First, all the slots are rough broached from the solid, indicated by No. 1 on the photo. Then the fixture is adjusted laterally to another row of inserts on the ram, and all slots are semifinished (No. 2). Readjusting to the center row of inserts, and broaching all of the slots (No. 3) completes the operation. CINCINNATI Hydro-Broach Machines, completely tooled up and ready for production, have reduced costs of hundreds of surface broaching and related operations, including such unusual jobs as the one illustrated here. Cincinnati Application Engineers can do just as much for you in paring your costs. Send blueprint of parts and complete data. ¶For complete specifications on CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach, write for catalog M-1389-2.





Above: This illustration shows the fixture used in broaching "Christmas tree" slots in one type of turbo-jet rotor.

Left: Close-up of the clamping arrangement for the fixture shown in the illustration above.

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NEWS *of the* AUTOMOTIVE INDUSTRIES

Vol. 101, No. 1 **July 1, 1949**

April Car Registrations Set New Postwar Peak

When all returns are in new passenger car registrations for April will be upwards of 390,000, according to R. L. Polk & Co., automobile industry statisticians. Although the total would set a new postwar peak, it would still be far below the all-time record of 515,034 new cars licensed in May, 1941, and considerably behind the 489,074 registered in April, 1941, and 481,673 in April, 1929. The previous postward record month was March of this year when 360,584 new cars were registered. The gain over April, 1948, however, was substantial, amounting to nearly 60,000 units. New truck sales, on the other hand, are expected to fall behind the April total of 108,168 units registered in April last year—the all-time high—to about 78,000 units. For the first four months of this year, the truck industry as a whole is only about 37,000 vehicles behind the total for the first four months of 1948.

Chrysler Division Announces Six and Eight Convertibles

The Chrysler Div. of Chrysler Corp. has introduced its 1949 convertible coupe in the six-cyl Windsor and eight-cyl New Yorker models. The wheelbases of the two models are 125½ in. and 131½ in. respectively. The Prestomatic fluid drive transmission is standard on both models. A feature of the convertible top is a flexible clear plastic wide vision rear window which folds when the top is lowered. It is approximately 774 sq in. in area.

Studebaker Continues Record Sales Drive

The Studebaker Corp. continues to make a remarkable showing in retail sales as compared with prewar years. The company's dealers during May made the highest number of retail deliveries of cars and trucks for any month in Studebaker history. May was the third successive month in which retail sales set a new record. May was also the largest production month in the company's history with a total of 27,434 cars and trucks.

A CHRYSLER TAKES A BOW

Now making its bow, this new 1949 six-passenger Chrysler convertible coupe has a 131½ in. wheelbase and is equipped with Prestomatic fluid drive transmission. It is available in six types of upholstery and 14 body colors.

Packard and UAW Extend Contract

The Packard Motor Car Co. and the UAW-CIO have agreed to extend their contract, which expired June 12, indefinitely on a day-to-day basis. The contract in question does not cover wages, but involves union representation and grievance procedures. Bargaining is continuing on a new contract. A separate wage agreement which has been in effect since June 10, 1948, continues in effect until Aug. 1, 1950, but may be reopened once by either party. It is believed that wage negotiations will be deferred until the outcome of the present Ford talks is known.

Three Truck Builders Get Army Contracts

Three truck manufacturers have been granted the first major contracts under the Army Ordnance procurement program. Willys has received an award for Jeeps and spare parts amounting to more than $12 million. The current design Army Jeep has a water-proofed ignition system and other modifications enabling the vehicle to ford streams while completely submerged. The vehicle's electrical system is particularly adapted to operate short wave radio developed for tanks in World War II. It also performs under extremely wide variations in temperature ranges. Reo Motors, Inc., has been awarded a contract for 5000 2½-ton 6 x 6 military trucks. Dodge Truck Div. of Chrysler Corp. has an order for 4000 ¾-ton four-wheel drive trucks.

Hydra-Matic Transmission Available on Lincoln

The Lincoln-Mercury Div. of Ford Motor Co. is now offering the Hydra-Matic transmission on its Lincoln and Cosmopolitan models as optional equipment at a price of $200. It will be called by its trade-marked name "Hydra-Matic." As first reported in AUTOMOTIVE INDUSTRIES, adoption of the Hydra-Matic was scheduled to begin in May. However, because of the Ford strike, installation of the first units did not start until a month later. At the same time several changes have been incorporated into the cars including shortening of the propeller shaft to conform to the automatic transmission requirements. A removable cross member has been incorporated into the frame to support the transmission and to facilitate servicing the unit. Other mechanical changes are adoption of a five-bladed fan which runs at slower speed and a different type of fan belt. The cars have new interior trim and now include foam rubber on seat backs as well as in seat cushions. Eleven new colors are also offered in place of the former selections. No decision has been reached yet as to

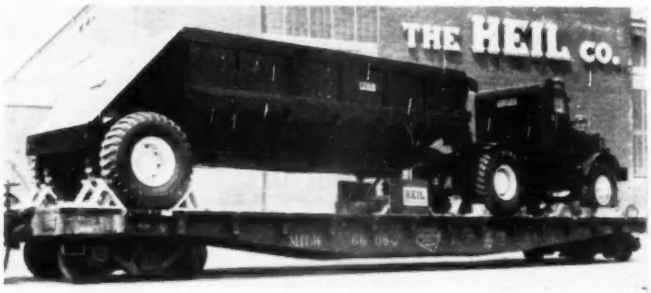
whether Mercury will adopt the Hydra-Matic transmission, but an automatic drive of some type will definitely be offered later this year. The best information available now indicates that it will not be Hydra-Matic, but it will probably be a torque converter type, probably a Borg-Warner.

FTC Calls Conference on Automobile Sales

The Federal Trade Commission will call trade practice conference proceedings on practices in the sale and in the financing of automobiles purchased on the installment plan. Automobile manufacturers, automobile dealers, financing organizations, and other interested groups will be invited to participate in a conference on Sept. 15 in Washington.

Grand Jury Indicts Tucker and Seven Associates

The latest blow to the fading hopes of The Tucker Corp. was the indictment of Preston T. Tucker, president, and seven other officers or persons affiliated with the formation of the company, by a Federal grand jury. Specifically, they are charged with mail fraud, violations of SEC regulations, and conspiracy. The 31 count indictment was returned by the grand jury in Chicago which spent 12 weeks investigating the affairs of Mr. Tucker and his company. Defendants named with Mr. Tucker are Fred Rockelman, sales manager and executive vice president and former sales director of Ford Motor Co.; Mitchell W. Dulian, a former director and general sales manager who previously had been associated with Buick in the sales division; Robert Pierce, formerly director and treasurer of Tucker and who previously had been secretary of the Briggs Mfg. Co.; Floyd D. Cerf, Chicago investment broker who handled the company's $17,450,000 stock issue; Cliff Knoble, Tucker advertising director and once affiliated with Chrysler Corp.'s advertising organization; Harold A. Karsten, formerly a Minneapolis attorney who aided in organization of the company, and Otis Radford, formerly director, treasurer and controller of the company and previously associated with the RFC office in Detroit.



HAIL THE HEIL!

This new Heil 40-yd coal mine body, shown at the American Mining Congress Coal Show in Cleveland recently, is said to be able to haul enough coal in one load to heat a home for four years. The body and Mack Diesel tractor are almost 50 ft long. Bottom dump doors extending the full length of the body are controlled by a valve in the tractor cab.

Dearborn Motors Building Office and Laboratory

Dearborn Motors Corp., national marketing organization for Ford tractors and Dearborn farm equipment, will soon start construction of a $2.5 million general office building, laboratory and parts warehouse. The company will also institute a multi-million dollar research program in farm equipment. The buildings will comprise a three-story office building with approximately 85,000 sq ft of space and a laboratory and warehouse building of 165,000 sq ft. The buildings will be located on a 45-acre site a few miles outside of northwest Detroit. The laboratory will house the expanded product research development and testing activities under the direction of R. E. Hunt, manager of the engineering and manufacturing division.

High Sales Not Delaying New Car Model Changes

Even though the automobile industry is booming along at a record rate, model changes are going along on schedule. At the moment the line-up is about as follows: Buick will be first with its Series 40 Special model series in August. Studebaker will also have a new model some time this summer. In line with the General Motors plan of making major styling changes every two years, a new "C" body will be coming along later this fall for the two larger Buick series and for certain of the Cadillac and Oldsmobile lines. An interesting speculation is the possible use of the new "B" body which will appear first on the Buick 40, for the Oldsmobile 88 and possibly one of the Cadillac models. Chevrolet and Pontiac will make no major design changes, but will be out with 1950 models either very late this year or early in January. However, since the current styling was introduced early this year, the only alterations in styling expected will be modified grille work and possibly other minor changes for identification purposes. Ford's plans are not clear, but at the time the present models were introduced, it was stated that they would hold for at least two years, which would indicate changes next spring. However, nothing is definite on that score. Chrysler Corp. introduced new models only a short time ago, and while there has been a certain amount of discussion about when the next model change will be made, there has been nothing official on it. The other independents are guarding their plans very carefully, and little is known at the moment about what they plan to do, but the evidence indicates that they will have no major styling changes for the next few months at least.

First Gas Turbine-Electric Locomotive

Making its public debut recently at the General Electric Co.'s Erie, Pa. works, the country's first gas turbine-electric locomotive has been announced by General Electric and the American Locomotive Co. The 4500-hp Alco-GE unit, which performed satisfactorily on preliminary runs, will be turned over to the Union Pacific for additional road tests in freight service.

Six Months' Vehicle Output Hits Three Million

The production performance of the automobile industry within the last few weeks has turned into a full steam program which is all the more amazing in view of the general letdown in production throughout the country in other lines. Thirty days ago it was felt that the industry would not reach three million vehicles by the end of June because of the loss occasioned by the Ford strike. However, since that time

Acme

SPORTY ROMEO

In the special model class at the third annual competition of the Automobile Club of Rome, this Alfa Romeo "Gran Sport" with body by Castagna was named the winning design. Powered by a six-cyl engine with three carburetors, it has a speed of 100 mph and is priced at about $8500.

the picture has changed, and estimates for the first six months of this year stand at well over the three million mark in U. S. and Canadian plants. U. S. production is estimated at about 2,960,000 cars and trucks. Traditionally, high points of automobile sales are April and May with some tapering off in June and a more definite decline in July. However, it is now certain that June sales will hit a postwar peak and production schedules are set for continuing heavy production at least through July and in some cases even further. GM has scheduled more than a million vehicles for the four months period from June 1st through September. The corporation is currently building at its originally planned schedule of 12,500 vehicles a day, according to C. E. Wilson, president.

Two GM Diesels and Torque Converters Power Euclid

The new model 1-FFD 34-ton tandem axle rear-dump Euclid featured at the 1949 Mining Congress Exposition in Cleveland, O. (shown in page 20 of the May 1 issue of AUTOMOTIVE INDUSTRIES), is powered by two 190-hp General Motors Diesel engines and equipped with torque converter units, each driving one rear axle. A three-speed Torqmatic transmission manufactured by the Allison Div. of General Motors is used with each torque converter. It is hydraulically controlled and manually operated.

GM Reported Planning N. Y. Car Show

A reliable report says that GM will again hold a special showing of its new model automobiles and other products in New York early next year. It is believed that the date will be approximately the same as that of this year's show which opened Jan. 20 and ran for a week. The action indicates that there is no planning going on in the industry for a general automobile show since it would be highly unlikely that GM would hold its own exhibits if a national show were being planned.

See High Employment for Automobile Industry

Continued high employment in the automobile industry, at a level slightly lower than last year, was indicated by a recent labor market study of the industry based on reports from local public employment offices to the U. S. Employment Service, Bureau of Employment Security. Employment in the 233 establishments covered by the survey was expected by July to show a small increase over the 656,000 workers employed in March, the month in which the reports were made.

K-F Expects Improvement in Third Quarter Earnings

Although Kaiser-Frazer is expected to show a loss during the second quarter, the deficit should be very much lower than the $5.8 million loss during the preceding three months. During the first quarter, rebates to dealers when the company cut prices March 30 accounted for more than $4 million of the deficit. According to Edgar F. Kaiser, president, third quarter operations are expected to be profitable. Production during the second quarter was largely from inventories of commitments of high cost steel which is now used up. With lower priced steel in supply from regular mill sources, profit position is expected to be greatly improved.

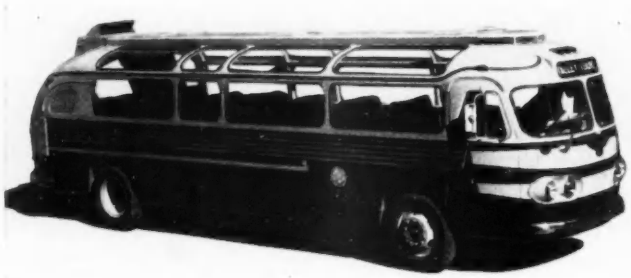
After a very dull selling season the first three months of this year, Kaiser-Frazer has rebounded and is currently expanding its production to 600 cars a day, or nearly double the rate of a few

Acme

FIRST AT THE THIRD

Winning first prize in the standard model class at the third annual competition of the Automobile Club of Rome, this Fiat "Mille Miglie Sport" (literally, "Thousand Mile Sport"), powered by a four-cyl engine, is said to have a speed of 100 mph. It is priced at $4200.

NEWS *of the* AUTOMOTIVE INDUSTRIES



AIR CONDITIONED SIGHTSEEING

Six air-conditioned Sightseeing coaches, of the type shown above, were recently delivered by the Flxible Co., Loudonville, O., to the Yosemite Park & Curry Co. They are two-tone green with Solex roof windows and have window shades which cover the roof windows.

weeks ago. The company has recalled from 700 to 800 production workers and says that a further increase in production is planned if demand continues at its present level. K-F officials report that since prices were cut March 30, sales have been exceeding production and that demand for the new utility cars has been better than the most optimistic expectations. Currently, about 50 per cent of K-F production is devoted to the utility line.

Chevrolet Baltimore Plant Puts on Second Shift

Chevrolet is continuing to accelerate its production drive which resulted in the second biggest monthly production in its history during May. A second shift has been added to the Baltimore assembly plant, increasing employment by 2000 in Chevrolet and Fisher Body plants there, and which will raise output eventually to 22,000 passenger cars and trucks a month. The Baltimore plant is the second Chevrolet unit to go on a double-shift basis recently. An extra shift was added to the St. Louis operation in March.

Diesel Speed Records Smashed in France

Diesel engine speed records set in 1937 by George Eyston with an English A.E.C., have been smashed on Montlhery track by a French M.A.P. (Manufacture d'Armes de Paris). The nine records are for distances from 200 mi to 12 hr, the highest speed attained being 112.38 mph for 200 mi. The car ran 12 hours at an average of 109.21 mph. Later an attempt will be made on the 24-hr record, still held by Mr. Eyston. The feature of the M.A.P. is that it is a horizontal opposed-piston two-stroke designed for tractor service fitted into a Delahaye chassis for demonstration purposes only. Two types of engines are manufactured, the smaller having two opposed cylinders and the larger model four cylinders of the same general design. The bigger model used for the records has a piston displacement of 305 cu in. and develops 120 hp at a maximum of 1800 rpm. Weight is 1210 lb. Each of the opposed pistons is connected to a rocker, the opposite end of which carries a short connecting rod mounted on the crankshaft carried below the cylinders. Air is fed through a blower and direct injection takes place into the combustion chamber between the two piston crowns. The cylinders are water jacketed. The oil supply is in the base below the crankshaft and exhaust, blower intake and injector are accessibly mounted on the top of the power plant. A fuel consumption of 20 miles per American gallon is claimed.

Packard Plans Construction of Atlanta Warehouse

Within 60 days the Packard Motor Car Co. will begin construction on a new zone office and warehouse at Atlanta, Ga. The project will include two one-story buildings connected by an all-glass breezeway on a 7½ acre site. The estimated cost of the facility, which will contain approximately 40,000 sq ft of space, is $500,000.

Collyer Assails Attempts to Curb Man-Made Rubber

In a sharply worded address before the SAE recently, John L. Collyer, president of B. F. Goodrich Co., attacked the proposal by foreign rubber companies that synthetic rubber production be curtailed by the United States. He branded the attempts of British, Dutch and certain other nations to promote restrictions on the output of man-made rubber in this country as a "threat to our national security

Wide World

FRESH AIR TAXI

A possible solution to crowded traffic conditions is this motorcycle taxicab which was shown at the recent trade fair in Hannover, Germany. Selling for about $700, its maximum speed is said to be about 31 mph and its gasoline economy is reported to be over 60 mpg.

and a cartel road which leads to totalitarianism." He said that because of efficient production of American-made rubber, healthy competition now exists, indicating that need for maximum efficiency by producers competing for sales in the world rubber market is apparent.

GM Official Sees New High for Company's '49 Truck Sales

Truck sales of the General Motors Corp. in 1949 will hit a new all-time high, William A. Casey of Detroit, central regional manager of the company's GMC Truck & Coach Div., asserted recently in Buffalo. "The corporation's truck sales so far this year have been running slightly ahead of 1948 and the trend is continuing upward, Mr. Casey said. "It is likely that total sales for the year will top our previous record set in 1948."

Three Former K-F Men Join Crosley

Three former Kaiser-Frazer sales executives have joined Crosley Motors, Inc., as regional managers. They are Arthur H. Babin, former K-F Buffalo regional sales manager; Lloyd M. Gregor, previously division sales manager of K-F; and H. M. MacDonald, who had been K-F regional manager at Seattle and division sales manager in Kansas City. Previously, W. A. MacDonald and Fred Cooper, former vice-president of K-F and sales vice-president, respectively, had acquired stock interests in Crosley and had joined the company in executive capacities.

Report Jaguar World's Fastest Stock Car

Claiming to be the world's fastest stock car, a 213 cu in. six-cyl Jaguar automobile has carried out speed trials in Belgium under the control of the Belgian Royal Automobile Club. The highest speed attained was 132.596 mph for the flying mile. The flying kilometer was covered at 132.362 mph. With a standing start the speed for the kilometer was 74.168 mph, and 86.434 mph for the mile. The mile and kilometer speeds were averages for a run in two directions and were made with the top concealed and a special wind shield. With standard top erected and stock side curtains, the highest speed was 126.594 mph for the flying kilometer. The 213 cu in. Jaguar has a six-cyl twin camshaft engine with a 7 to 1 compression ratio.

NEW SLANT FOR A STUDEBAKER

Displayed at the recent SAE summer meeting in French Lick, Ind., this special body was designed and built on a Studebaker Champion chassis by Vince Gardner of Loewy Associates.

Body Engineers to Hold Annual Meeting in Nov.

The annual technical convention of the American Society of Body Engineers will be held in Detroit Nov. 2-4. Glenn F. Doyle, engineering supervisor of Ford Motor Co., will be general chairman. In addition to the eight technical sessions which have been scheduled, the convention will again feature exhibits by suppliers and parts manufacturers who will display their newest products.

Hydra-Matic Transmission On 98% of Cadillacs

Cadillac is currently leading the field in the percentage of total production sold with an automatic drive. The company figures show that 98.4 per cent of all cars sold from last November, when 1949 model production started, through May of this year were equipped with the Hydra-Matic transmission. The trend has been steadily upward in the postwar period, accounting for 87 per cent in 1946 models, 92 per cent for 1947 models and 97 per cent on the 1948 series. Even more marked is the increase over the percentage of Cadillacs equipped with Hydra-Matic in 1941 and 1942 when it was 30 per cent and 60 per cent, respectively.

Chrysler Adds Plymouth to San Leandro Assembly

The Chrysler Corp. has altered its manufacturing practice slightly to make distribution of passenger cars on the West Coast more efficient. Assembly of Plymouth cars will be added to production schedules at the Dodge plant in San Leandro, Calif., which is currently building Dodge passenger cars and trucks. In addition, Dodge passenger cars will be built at the Los Angeles plant in addition to Chrysler, DeSoto and Plymouth cars now being produced there.

K-F Appoints R. A. Graney Labor Relations Chief

Robert A. Graney has been appointed assistant to the president in charge of industrial relations by Edgar F. Kaiser, president of the Kaiser-Frazer Corp. He formerly had been assistant to the vice-president in charge of operations at the Kaiser Steel Mills in Fontana, Calif. J. O. Murray, formerly director of industrial relations for K-F, has been transferred to the West Coast on special assignment.

Hudson Backs L-Head Engine for High Compression Use

Hudson states that its present six- and eight-cyl engines are capable of providing compression ratios up to 12.5 to 1. Both engines are of L-head construction. A. E. Barit, Hudson president, at a press meeting in Detroit, said that with present standard gasoline the present six engine has a compression ratio of 7.12 to 1 with an aluminum head, and the eight-cyl engine, 7 to 1. He said that with 100-octane fuel and adapted for higher compressions, both engines will be supplied with a compression ratio of approximately 9.3 to 1 and that if fuels of higher octane than 100 become available, the necessary compression will be provided. He reported that in tests with higher compressions, outstanding improvements in power, acceleration, and economy have been shown. Mr. Barit also said that the new six-cyl engine introduced last

year was designed to meet any compression ratio increases permissible with fuels available in the foreseeable future and that all parts of the engine were engineered and designed for increased load requirements of high compressions.

Automotive Parts Sales Off 8 to 12 Per Cent

Automobile manufacturers report that parts sales this year are running on the average from 8 to 12 per cent behind last year. The companies have been actively working with dealers during the first four months of this year helping them to balance inventories. They point out that there is little need for heavy stocks now that the material shortage is over and that since there are no refunds on inventories if prices are reduced, it is to the dealer's advantage to keep his stock balanced with his needs and to avoid heavy inventories, especially on slow moving parts. General price cuts are not expected, but undoubtedly there will be some items that will be reduced, especially those related closely to raw material prices.

Westinghouse Reveals Executive Changes

Designed to provide more adequately for Westinghouse Electric Corp.'s greatly expanded postwar activities and new product lines, vice president L. E. Osborne has been assigned staff supervision over all the company's manufacturing activities, including all matters of production and industrial relations. Simultaneously he retains operating responsibility for five major manufacturing divisions. In addition, James H. Jewell, vice president, has taken over staff supervision of all sales and marketing on a company-wide basis, and John K. Hodnette, vice president and head of the Transformer Div. at Sharon, Pa., has become general manager of industrial products with headquarters at Pittsburgh. John M. McKibbin, vice president and former head of advertising and sales promotion, has been appointed general manager of consumer products with responsibility for operation and distribution of the Appliance Div. and the Home Radio Div.

Reelect George W. Mason President of AMA

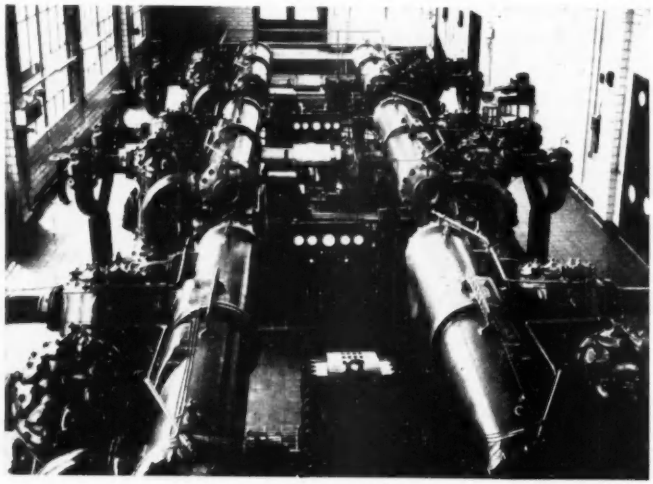
George W. Mason, president of the Nash-Kelvinator Corp., has been reelected president of AMA. All other officers were also reelected. They are H. S. Vance, Studebaker Corp., and E. J. Bush, Diamond T Motor Car Co., vice-presidents; M. E. Coyle, General Motors, secretary; George T. Christopher, Packard, treasurer; Alfred Reeves, advisory vice-president; and William J. Cronin, managing director. Directors whose term of office expired have also been reelected.

Borg-Warner Closes Ohio Steel Mill

The Borg-Warner Corp. has closed its Superior Sheet Steel Div. mill at Canton, Ohio. The Superior operation, although one of the most modern hand mills, has been made obsolete by the modern wide strip mill, according to the company.

Passenger Car Tire Prices Cut 5 to 7½ Per Cent

Price reductions on passenger car tires are pretty well completed now throughout the tire industry. The latest price cutting action was started by Standard Oil of Ohio in late May when it reduced prices of its Atlas tires by 19 per cent. The larger companies followed with reductions of five per cent on standard low pressure tires and 7½ per cent on deluxe lines. Passenger car tubes were also reduced 7½ per cent. The first price cuts in the tire industry since before the war were made about a year and a half ago, but were cancelled out by 6½ per cent price increase a few months later.



POWER BY AIR

At the new factory of GM's Ternstedt Div. in Columbus, Ohio, compressed air serves as power for much of the production machinery. In the compressor room, shown here, two of the twin-unit compressors are operated by steam turbines and the third by an electric motor. The Dravo Corp. designed and constructed the power plant.

Caterpillar Tractor Plans Stock Offering

The Caterpillar Tractor Co. has registered a proposal with the SEC to sell 250,000 shares of $100 par cumulative preferred stock. The proceeds would be earmarked to provide capital for expansion and to retire $21 million in promissory notes.

E. D. Longnecker Appointed L-M Service Manager

E. D. Longnecker, former parts and service manager for Packard, has joined the Lincoln-Mercury Div. of the Ford Motor Co. as national service manager. He will succeed G. H. Schricker who will work on special assignments in the field sales organization.

Trico Ships Factory to England

Trico Products Corp. of Buffalo has solved the problem of plant expansion in England, where building materials are painfully short, by shipping over-

NEWS *of the* AUTOMOTIVE INDUSTRIES

A BOMBER FIRST

The world's first track-tread type landing gear for medium or heavy bombers successfully completed its first taxi tests by Boeing Airplane Co. on this 164,000-lb USAF B-50 Superfortress. The new Boeing experimental landing gear is being used to investigate the possibilities of utilizing unimproved, unpaved runways for the operation of heavy bombers. Consisting of double tractor-like rubber treads for the main landing gear units, and a single tread unit in place of the nosewheel, the new system completely retracts when the airplane is in flight.

seas a complete ready-made factory for its British subsidiary. The prefabricated factory, which will cover more than two acres, is now in the process of being put together in London's industrial West End for Trico-Folberth, Ltd.

New Plant Makes Pistons in California

Manufacturing a complete line of pistons for truck, tractor, marine, and industrial engines, the Jahns-Hill & Co. have established a new plant at Santa Ana, Calif. Jahns-Hill have patterns on hand for a great many of the older pistons, and will specialize in the production of those that cannot be found elsewhere.

Chrysler Official Names J. von Rosen to Staff

John von Rosen has been appointed to the staff of Herman L. Weckler, vice president and general manager of the Chrysler Corp. He will serve on special assignments. Mr. von Rosen has been associated with Chrysler for the past 17 years, joining the Plymouth Div. as plant layout engineer in Detroit in 1932. Prior to his current appointment, he was plant engineer of the Plymouth Div.

Oldsmobile Makes Changes In Engineering Staff

Key changes in the Oldsmobile production engineering department have been announced by J. F. Wolfram, chief engineer. L. A. Kintigh has been made assistant chief engineer in charge of chassis, body, and standards engineering. He was formerly experimental engineer and in his new position will work closely with H. N. Metzel, assistant chief engineer in charge of motors, transmissions, and experimental engineering. James Dystra will continue as executive engineer. D. C. Perkins, formerly chassis engineer, has been promoted to succeed Mr. Kintigh as experimental engineer. Other appointments include T. W. Loring as styling engineer and Stanford Landell as body engineer.

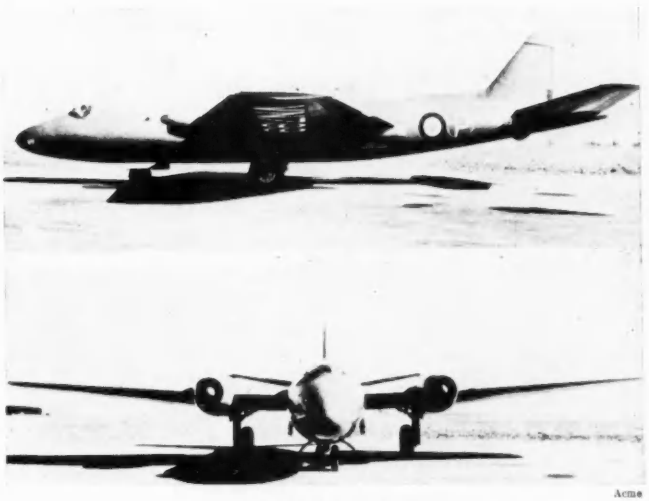
GE Test Center to Study More Powerful Jets

Engineers will be able to study jet engines nearly four times as powerful as those now in production at the General Electric Co.'s $25 million jet center at Lynn, Mass. C. A. Salmonsen, manager of the company's Aircraft Gas Turbine Divisions, said that new methods of thrust augmentation now under development, and other improvements including new metals and better fuels, would make possible engines of 10,000 to 20,000 lb thrust.

Car Sales Face Fight from Other Products

Major competition for both automobile dealers and factories for a larger slice of the consumer dollar is not from competing automotive products, according to J. R. Davis, vice-president—sales and advertising, Ford Motor Co. Addressing the Michigan Automobile Dealers Association in Detroit recently, he pointed out that for the past 25 years dealers have been getting a good share of the consumer dollar for new and used cars sales and service, perhaps as much as 10 per cent, but that now many old and some new commodities are in certain respects favored to increase their take of expendable consumer income.

(*Turn to page 60, please*)



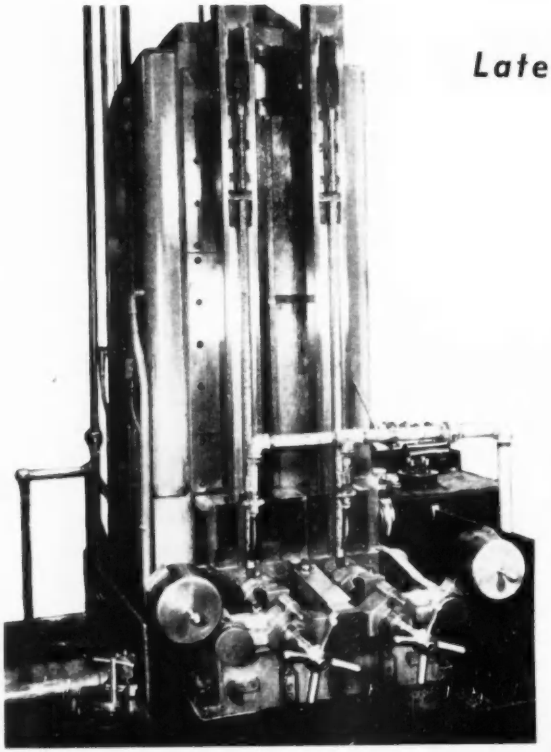
Acme

A BRITISH FIRST

Built by the English Electric Co., Ltd., this is reportedly the first British jet bomber to fly. Called the A.1, the new plane is powered by two Rolls-Royce Avon jet engines.

Latest Practices in

Making

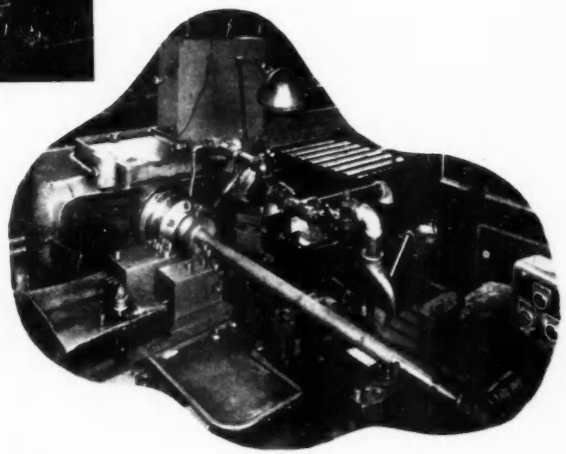


THAT the impressive improvement in metal cutting through the adoption of machine tools of advanced type is widespread in the automotive industries is evident in the postwar programs of many of the leading parts makers. An outstanding example is found in the continuing program of the manufacturing divisions of Eaton Manufacturing Company, one of the major suppliers of the industry. What is going on is best illustrated by highlights of recent improvements at the Axle Division in Cleveland.

During the past several years a great deal has been written about the transfer machines installed in passenger car plants. We find that the Axle Division has had an interesting transfer machine in operation for almost two years. Built by the Vulcan Tool Co., this machine handles a variety of drilling, reaming, tapping, and milling operations on the differential carrier for two-speed axles. As illustrated, it represents an integration—on a common base—of eleven vertical heads, three horizontal Ex-Cell-O units at the front, six horizontal Ex-Cell-O units in the rear, and an additional horizontal unit at the last station in the rear. Further details of this machine together with a complete listing of operations will be found later in this article.

The latest acquisition in this plant is a special Cross machine of horizontal type designed far a variety of drilling, milling, counterboring, and other operations on shifter forks. As illustrated, the Cross machine has a four-station trunnion fixture, holding three pieces of work at operating stations, with one station for loading and unloading. It has two large horizontal heads, one small vertical head, and a small head at right angle to the axis of the two main heads in the rear.

This compact machine is automatic in action,



This view of one of the large Sundstrand Model 12 Automatic lathes was posed with guards removed to show clearly the flanged axle shaft in position and the arrangement of cutting tools. It may be noted that the shaft is supported by a center rest to aid in alignment and to prevent whip or chatter.

(Top, left)) Close-up of work station of one of the American Broach vertical surface broaching machines on the differential case half. One broach takes a pair of half-holes, the other cuts the holes at right angles. Stock removal is of the order of 4½ oz. of metal per piece.

Modern Transfer Machines, Automatic Lathes, Automatic Loading Devices, and a Huge Broach for Internal Gears are Among the Interesting Pieces of Equipment at Eaton Manufacturing Company's Axle Division in Cleveland

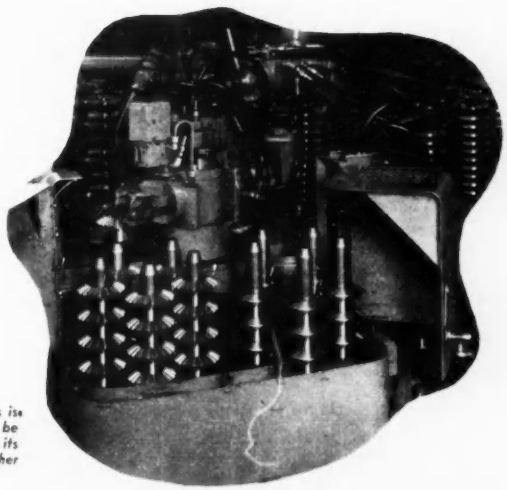
Rear Axles

By Joseph Geschelin

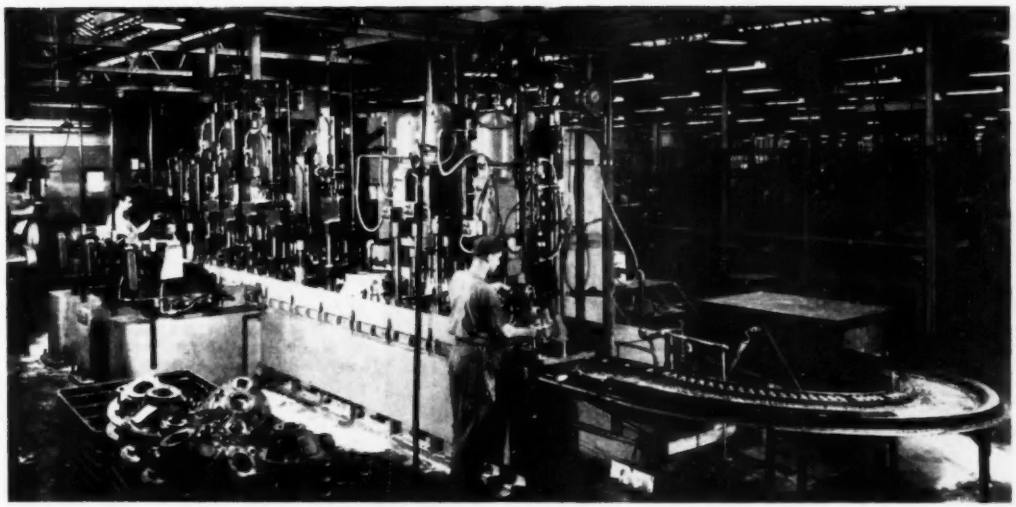
and is so designed as to permit the machining of a number of different forks simply by making changes in the tooling. Up to now forks have been machined in lots on a line of single spindle drill presses, milling machines, and other simple equipment. This procedure involves a number of different operators and requires movement of work in and out of fixtures progressively from one machine to another. The single special purpose machine does the entire job in one cycle.

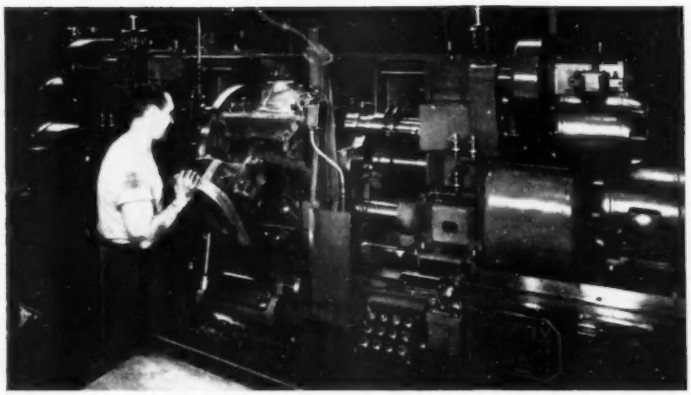
Consider another example. They have a group of Stokerunit three-way machines for boring the differential carrier mentioned earlier. Three-way boring machines for this purpose are not a novelty. But these Stokerunits are much more intricate and perform more operations in the same setting. As illustrated, the machine has a four-station trunnion fixture holding work at three operating stations, leaving one station for loading and unloading. The first station does the

Close-up — with guards out of the way — of the big Gleason Revacycle bevel gear machine for cutting differential side gears. The loading device may be seen directly in the center of the work station, in the act of loading a finished gear onto one of the spindles of the carrier.



(Below) Among the early postwar installations of transfer machines is the Vulcan unit pictured here. The Ex-Cell-O horizontal units may be seen in the background at the left. The conveyor may be seen on its return loop at the extreme right, carrying fixtures through the washer in the background at the right.





View of the three-way Simplex Smokerunit for boring the differential carrier. The ingenious loading device fitted on this machine may be seen here, showing the ease with which work is loaded into the trunnion fixture.

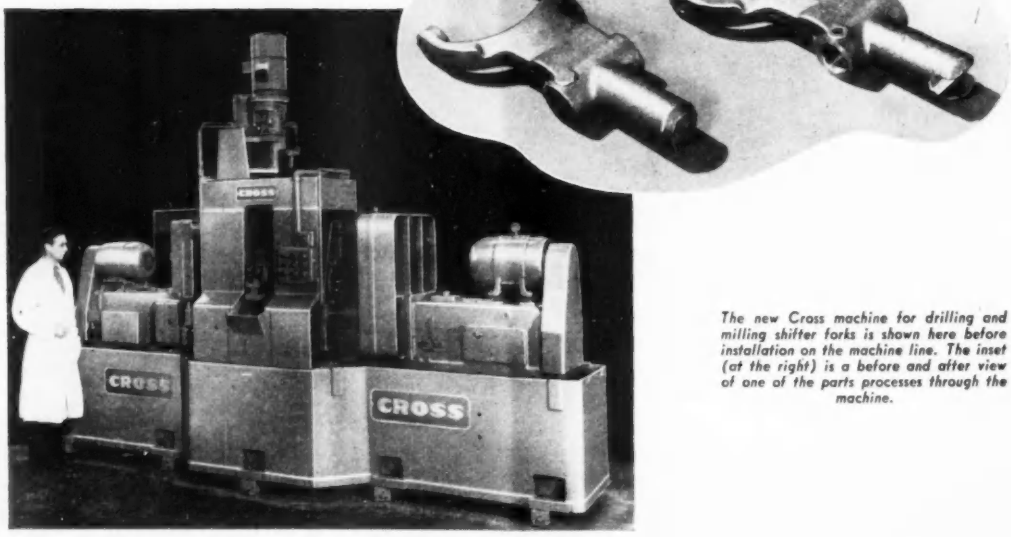
Making Rear Axles

rough-boring of the cross bore; the second station does the finish-boring of the cross-bore and at the same time has a third head at right angle for finish-boring the pinion bearing line. In addition, the third head—in the rear—contains an expanding tool which comes out at the proper point in the cycle to do a facing operation. The third station, at the top of the machine, has heads on each side for threading the cross bore.

An important feature of the machine is the provision for facilitating loading. For this purpose there is a hinged leaf mounted on the apron. The carrier is loaded into the leaf, then as it is swung upward the leaf positions the work directly into the trunnion fixture.

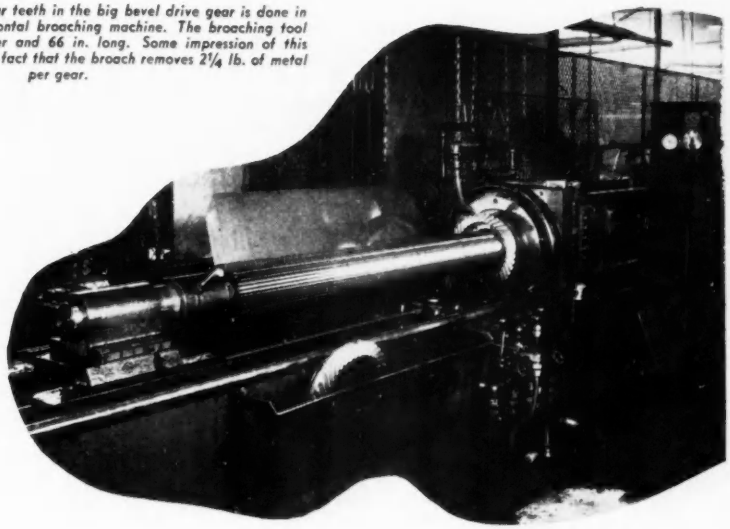
Another interesting operation is the surface broaching of side pinion shaft bores in the differential case. The case is made in two halves, one of the halves having legs for the planetary pinion shaft bores which are drilled later. The surface broaching operation consists in cutting perfect half bores with axes at right angles in the mating faces of the two halves. This is done in two vertical American Broach machines, one for each half. Each machine has two fixtures. One pair of half bores is broached at the first station, then the part is transferred to the second station where it is indexed from the broached holes for the second pair broaching operation.

The broaching ram carries two identical sets of tools. The machines have a ram stroke of 64½ in.,



The new Cross machine for drilling and milling shifter forks is shown here before installation on the machine line. The inset (at the right) is a before and after view of one of the parts processes through the machine.

Broaching of 44 internal gear teeth in the big bevel drive gear is done in this immense LaPointe horizontal broaching machine. The broaching tool is about 9¼ in. in diameter and 66 in. long. Some impression of this job may be gained from the fact that the broach removes 2¼ lb. of metal per gear.



and are adjusted for a ram speed, cutting, of 27 fpm. Each stroke of the ram, therefore, produces four half holes, each one about ¾ in. long and 0.471 in. in diameter. The operation is controlled so precisely as to permit interchangeability of pairs of differential carrier halves without selective fitting. Total stock removal on each piece is 4½ oz.

Good metallurgical control is one of the major requirements in the plant because of the variety of parts and differing materials specifications, and the need for accurate and economic control of heat treatment. Consequently, Eaton has extensive heat treating facilities of advanced type and a comprehensive metallurgical laboratory charged with the control of these facilities.

An interesting piece of equipment in the heat treating department is a large Surface Combustion continuous gas carburizing furnace. It is of four-row type with four separate conveyor lines through it. The large gears processed in this furnace are held at 1700 F for 12 hours, this treatment producing a case of 0.050 to 0.065 in. in depth. A feature of the furnace is the provision of external chambers—one at the front for loading, the other at the rear for unloading. This is very effective in protecting the furnace atmosphere from sudden changes in temperature and from contamination. These chambers are operated alternately so that only one is in action at any time.

At the end of the furnace cycle, work is unloaded in batches and is quenched in the Gleason quenching machines installed adjacent to the furnace.

To speed the machining of the long flanged axle shafts, Eaton recently installed a battery of four large Sundstrand Model 12 Automatic lathes which have the rigidity essential for high speed metal removal of this character. The need for power and rigidity may be appreciated from the fact that such axle shafts are machined after heat treatment. The shafts are made of SAE 4340 alloy steel and have a hardness of 388-444 Brinell. The flange is drawn before machining but

(*Turn to page* 62, *please*)

Sequence of Operations on Differential Carrier in Vulcan Transfer Machine

Station	Operation
1A	Drill 1 3/32 in. oil scoop hole (1 11/16 in. deep), straddle mill shifter fork bosses
2A	Drill 1 3/32 in. oil scoop hole through
2C	Drill 2 5/32 in. shift hole
2E	Drill 5/8 in. shift hole
3A	Spotface shifter cover boss, spotface oil scoop boss
3C	Drill 23/64 in. lock screw hole
4A	Drill (6) 31/64 in. holes in pinion end, drill (2) 23/64 in. bracket holes
4C	Drill 1 3/16 in. hole for 1 in. pipe tap
4E	Counterbore 0.940 in. shift hole
5A	Drill (3) 23/64 in. cover holes, drill (1) 32/64 in. cover hole through, drill (2) 23/64 in. bracket holes, drill (1) 3/8 in. hole in pinion end, drill (1) 9/32 in. hole in pinion end
5C	Combination co'bore & co'sink 1.247 in. diam
6A	Countersink (6) cage holes, comb. co'sink & spotface (2) bracket holes, spotface (2) shifter boss holes
6C	Spotface 1 3/8 in. diam oil scoop lock hole
6E	Ream 0.655 in. shifter hole
7A	Ream 1.121 in. oil scoop hole
7C	Ream 0.814 – 0.817 in. shifter hole
8A	Combination drill 1 9/32 in. & 1 7/16 in. oil scoop hole, countersink (4) cover holes, comb. countersink & spotface (2) bracket holes, countersink 3/8 in. diam hole, countersink 9/32 in. diam hole
8C	Tap 1 in. pipe thread, tap 7/16 – 14 lock screw hole
9A	Tap 1 3/8 – 12 oil scoop hole
10A	Tap (6) 9/16 – 12 holes in pinion end
11A	Tap (8) 7/16 – 14 cover & bracket holes

High Compression Without

By Alex Taub

THE automotive industries are again at the crossroads of major decision regarding change where their engines and fuels are concerned. Change is imminent. Change is economically allowable at this time. Change is necessary. The factors that will condition change are:

1. The basic target for high duty fuel for defense is no longer high octane. It now is middle range or "middle barrel" or in the low octane bracket. Reason — continuous combustion power plants for aviation.

2. Jet and turbine engines do not depend on high octane fuel but will require large amounts of low octane fuel. Reason — the pounds of fuel per pound of thrust is high, and since this type of engine makes available greater possible thrust, that extra thrust will be used. Thus we have more fuel per pound of thrust and an increase in the usable thrust.

3. Substitute fuels are sure to become the order of the day to provide an eventual continuing fuel supply while reserves of natural fuels may be husbanded. Thus crude oil from shale and coal may be the basis of our motor fuel. The investment to arrive at this phase of substitute crude is staggering; to add to this the cost of the additional equipment to convert this crude to high octane fuel (100 or better) would be as deplorable as it may be unnecessary. We shall have equipment or investment difficulties to meet the shortcomings of gasolines made from synthetic or substitute crude oil to fit them to our present engines. Reason—six billion dollars worth of steel equipment will be required to reach an adequate supply of substitute crude oil, and four billion dollars will be required for increase of refining capacity for the future; a total of ten billions of dollars for quantity only.

4. If industry and the users of automotive equipment are to have continuing supplies of fuel at acceptable dollars per mile for fuel, then better miles per gallon must be available.

5. Many present day engines have no longer a vested tool burden. They have been used through constant refinement between ten to fifteen years. Today they do not reprsent the capabilities of the industry that produces them.

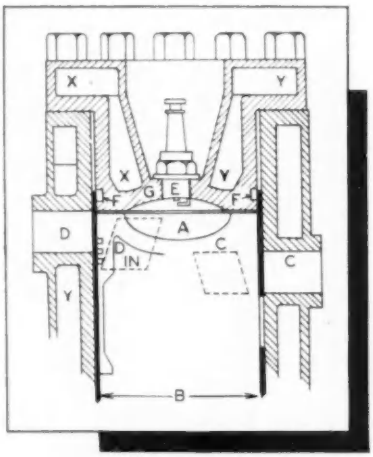


Fig. 1—Argyle single sleeve engine. A—Combustion chamber. B—Sleeve. C and D—Ports in cylinder block. E—Spark plug. G—Cylinder head. F—Sealing ring. X and Y—Passages for coolant.

This present position with regard to change is a repetition of history. In the period of 1921 to 1927 great changes in engines were general. It was the period of great beginnings and the passing of important power plants. However, the most important event during this period was the awakening of our understanding of the limitations created by detonation.

Ricardo in England was hammering at us in a continuous flow of papers that detonation could be governed to some extent within the engine, and we all began to wonder what really could be our highest useful compression ratio. Ricardo's cylinder heads incorporated the quench area, and Robert Janeway taught us that this area within limits could "quench" detonation by cooling the last gas to burn. Midgely and a group of wonderful chemists at this time set themselves the task of controlling detonation by chemistry.

By these efforts two avenues of engine progress were open to the automotive engineer, anti-detonation by engine design and/or anti-detonation by chemistry. The vehicle industry elected to use a little of both, engine development and tetraethyl lead in the fuel, and between both efforts we have progressed from 5.25 to 1 to 7.50 to 1 compression ratio.

In aviation the story was quite different. That industry elected to depend entirely on the chemistry of the fuel, and today the power output depends on a fuel whose relative octane value is no longer available despite the aid of alcohol-water injection. In other

High Octane Fuel

What Are its Possibilities?

PART I

Because of the tremendous interest in high compression engines and their development with respect to mechanical and chemical octane numbers, AUTOMOTIVE INDUSTRIES presents this special series of four articles by Alex Taub on "High Compression without High Octane Fuel" to supplement the extensive reports on high compression automobile and aircraft engines utilizing high octane fuel. Part I in this issue points out the advantages of conserving petroleum reserves by using a larger proportion of the crude and describes several high compression engines designed to operate on low octane fuel. Part II deals argumentatively with fuels, and in this article Mr. Taub draws some interesting conclusions. The history of combustion chamber design is traced in Part III from the 1920s up to the present time. Typical designs are described and illustrated. In Part IV the author explains why the piston engine will survive for aviation despite the progress made in jets and gas turbines. Special types of combustion chambers and valves are described and illustrated in this final article of the series.

words, the present piston engine of aviation has reached the limit of available fuel. Perhaps the jet engine success has much to do with the limitations set on the available fuel.

The vehicle industry has established a back-log of experience in dealing with detonation. The aviation industry uses engine designs that do not have the remotest inherent anti-detonation.

Today 12 to 1 compression ratio is publicized as being available. We are told all we need is the fuel. Again chemistry is the suggested method of progress. The engines are considered as being prepared for 12 to 1 compression ratio by merely improving their general rigidity. Unfortunately the necessary fuel for high compression is not available, hence instead of 12 to 1 we find 7½ to 1 as the limit of compression ratio and this with the best of commercial fuels. A 12 to 1 compression ratio engine can only be such when it will either operate on presently available fuel at this ratio or when suitable fuels are economically available for this compression ratio.

When we say economically available we mean under general distribution wherever American equipment is being used, at a reasonable price. Twelve to one compression ratio would undoubtedly balance the additional fuel cost to some extent by additional miles per gallon. However, this does not balance the fuel equipment cost to provide the volume of fuel needed or the distribution problem which must be wide. However, one important factor has been served by the recent discussions and this is emphasis on the fact that change is imminent, but we contend, that change need not be in the chemistry of the fuel insofar as it may affect the highest useful compression ratio.

We are again at the point of decision. Shall we find

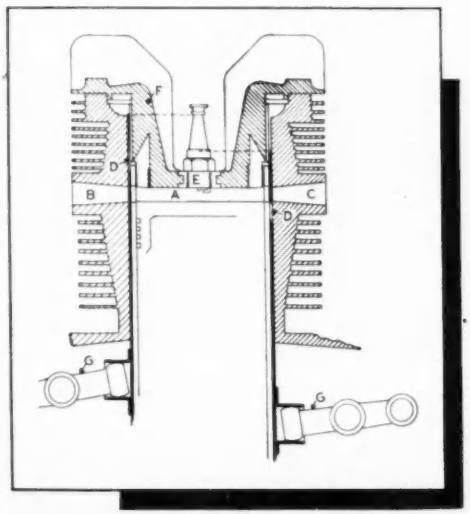


Fig. 2—Skinner single split sleeve engine. A—Combustion chamber. B and C—Intake and exhaust ports. D—Ports in split sleeve. E—Spark plug. F—Cylinder head. G—Rockers.

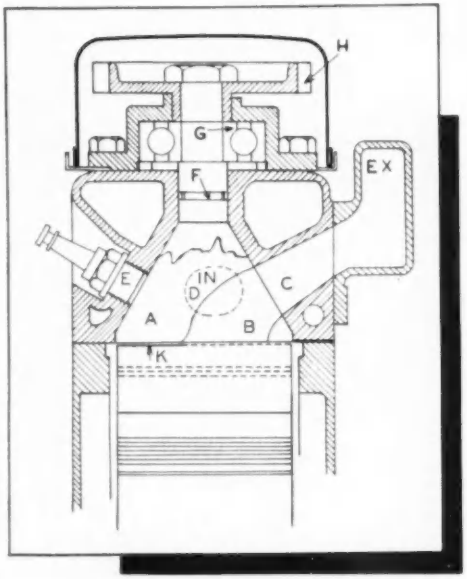


Fig. 3—Aspin rotating combustion chamber engine. A—Rotating combustion chamber. B—Firing chamber. C—Exhaust port. D—Intake port. E—Spark plug. F—Sealing ring. G—Ball bearing. H—Gear for driving rotating combustion chamber.

anti-detonation in the engine or anti-detonation by chemistry? Both have proved to be usable. Both require effort to bring them to public use.

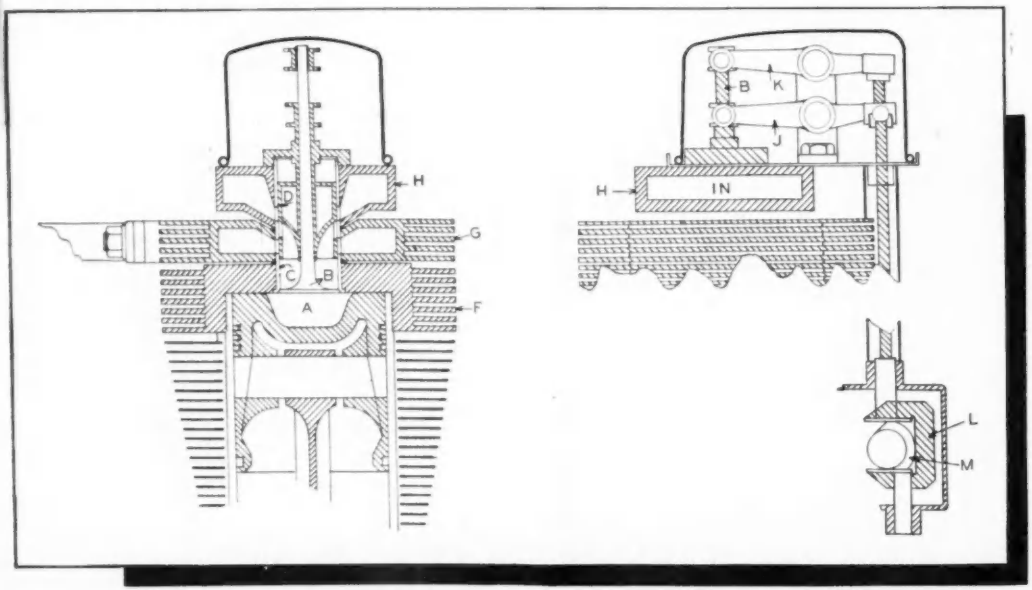
During the war, chemical progress was definitely made in the matter of fuel, and projections were made from experimental work, until today there are the urgings that the fuel industry should turn its attentions and efforts to the production and distribution of a super-fuel that would permit the use of 12 to 1 compression ratio. The size of this undertaking is not only immense but comes at a time when the project must be viewed with some concern. Meanwhile, aviation which heretofore supported the development of high octane fuel turns in the direction of lower octane.

Large investments for production are needed to increase the total supply of fuel. Higher octane fuel would lower the total output and absorb too much of the investment in fuel production of the future. The fact to keep in mind is that in general 65 octane represents the most economical type of fuel to produce.

Aviation may lift its requirements for jet engines in order to have available a greater percentage of the fuel barrel. It cannot support by premium or subsidy the development of fuel it believes it may not need. There will always be a percentage of high octane fuel produced for special purposes by present processes but there is little chance of regularizing the use of high octane without major changes in fuel production equipment and investment.

"Broad-minded" engines with inherent anti-knock ability have been with us for a long time. In 1919 this

Fig. 4—Abell single valve engine. A—Combustion chamber. B—Valve. C—Permanent cylinder head sleeve. D—Oscillating sleeve. F—Cylinder head. G—Exhaust manifold. H—Intake manifold. J—Rocker arm which operates oscillating sleeve. K—Rocker arm which operates valve. L—Yoke. M—Cam.



High Compression Without High Octane Fuel

author tested an engine with 9.5 to 1 compression ratio with the fuel available at that time, which probably represented 55 to 60 octane, without detonation. I only reported that the new cylinder had broke the crankshaft. There have been many engines built and tested over the last thirty years which have operated under elevated compression ratios with ordinary fuel without detonation. Early experience with non-detonating engines came at a time when understanding was lacking, hence the importance of these engines was lost in the shuffle of resistance to change. In some cases it was because of serious mechanical or lubricating difficulties. One organization in 1923 reluctantly tested a non-detonating engine and one afternoon their reluctance developed into a brilliant idea of discouraging the inventor by replacing all the gasoline in the test fuel tanks with kerosene. The engine being tested had a compression ratio of 9 to 1, and the fact that it ran all afternoon without much difficulty failed to register as history in the making. The new engine was turned down mainly because the then standard engine was satisfactory.

Among the many non-detonating engines of the past years, the principal ones were, the Argyle single sleeve, the Skinner split sleeve, the Aspin rotating combustion chamber and the Abell single valve engine. These engines are capable of using 70 octane fuel with from 9 up to 11 to 1 compression ratios. They represent an additional octane latitude compared to present engines of from 25 to 40 for vehicle engines. The least of these would do as well with 55 octane fuel as present engines do with 80 octane fuel, or would allow a compression ratio around 10 to 1 with 80 octane fuel. The best of these engines this author saw in operation with 14 to 1 compression ratio with 78 octane fuel.

Actually there is more experience throughout the automotive industry over the years with high anti-knock engines than with extreme anti-knock fuel. Which of these projects should be followed through and given to the public? On one hand we find ourselves with old engines needing retooling for change, and on the other, "the rider of the purple blends" trying to go in two directions at one time. More low octane fuel for the jets, and more high octane fuel for vehicle use.

If it is argued that a change in the fuel would eliminate the necessity for a tooling change for the engine, then we must point out that higher output engines by any means would require greater rigidity than can be obtained by simple tool changes.

From the foregoing we find it fair to say:

(a) Engines with high compression ratios from 10 up to 12 to 1 are available with approximately 80 octane fuel.

(b) High compression ratios can be based upon non-detonating engines.

(c) Non-detonating vehicle engines can lead to more fuel production by offering up to 8 to 1 compression ratios with 60 to 65 octane fuel.

(d) Non-detonating engines do not require restriction in fuel production and can be used all over the world with present fuels.

(e) Dependence upon special fuel for high compression would restrict the use of American automotive equipment to the area of distribution.

(f) The present cost of fuel in many parts of the world is very high. Any increase in fuel cost in such areas would be a burden and automotive equipment users in these places would avoid equipment requiring more expensive fuel.

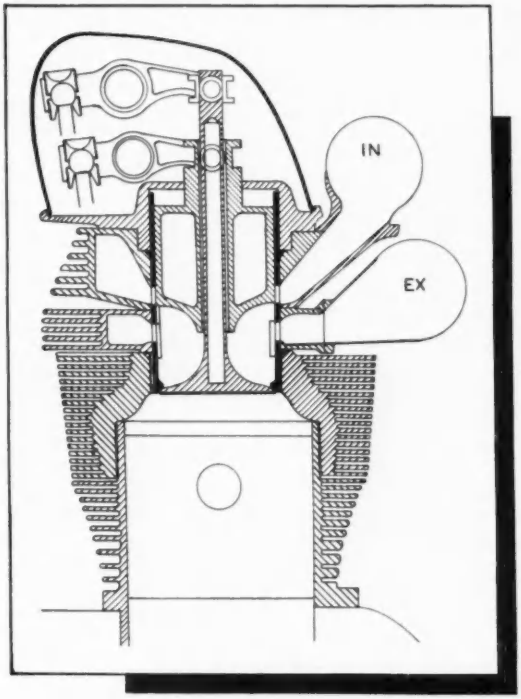


Fig. 5—Sectional view showing details of valve mechanism in Abell single valve aircraft engine.

Piston Engines for Aviation

Implied in the foregoing is the fact that piston engines for aviation are finished. This is an opinion quite generally held up to a short time ago and has been so given in several technical papers.

At times this question of engines for aviation has revolved around the query, "Shall we concentrate on speed or range?" Speeds of 1000 mph up seem beyond the present capabilities of the propeller type of power plant, particularly in relatively light aircraft that

(*Turn to page* 68, *please*)

Swedish Aircraft Lightweight Car

Saab-92 Is Powered by Two-Cylinder, Two-Stroke Engine and Equipped with Four-Wheel Independent Suspension of Torsion Bar Type. Front-Wheel Drive Another Feature.

STOCKHOLM, SWEDEN.

A SWEDISH aircraft plant is now producing a few test units of a new passenger car, the Saab-92, which will make its initial appearance on the Swedish market in 1950. Although company officials refuse to disclose the retail price of the car, indications are that it will retail in Sweden for approximately 6000 to 7000 Swedish crowns ($1800 to $2000).

The Saab-92 is a product of the Svenska Aeroplan Aktiebolaget in Linkoping, and will be manufactured in factories at Linkoping and Trollhattan.

The new car is a small two-door, four-passenger model of integral body and frame construction. It has front wheel drive with the engine placed transversely in front of, and parallel to, the front suspension.

Front and rear wheels are independently suspended by means of longitudinal swinging arms and transverse torsion bars. Shock absorbers

Condensed Specifications of Saab-92

Overall length (in.)	154
Overall width (in.)	64
Overall height, (loaded) (in.)	56
Net weight (lb)	1680
Wheelbase (in.)	97
Tread (in.)	46
Turning radius (ft)	18
Tires	5.00-15
Engine type	2-stroke
Brake hp @ 3800 rpm	25
Piston displacement (cu in.)	47
Bore (in.)	$2^{5}/_{32}$
Stroke (in.)	3
Compression ratio (to 1)	6.6
Max. torque (lb-ft)	40.5
Gear ratios (to 1)	
Reverse	24.65
First	18.5
Second	8.55
Third	5.35

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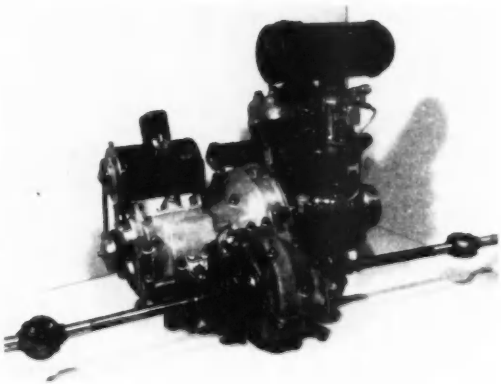
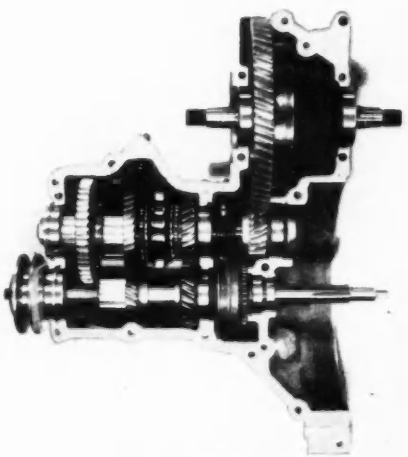


(Above) Unit power plant of the new Swedish car. Water circulation is thermo syphon system and no fan is used.



(Right) Upper half of the transmission case with gears and shafts in place. An overrunning clutch device permits shifting from third speed to second without releasing the clutch. The pulley shown at left in the illustration drives the generator.

Builder to Introduce in 1950

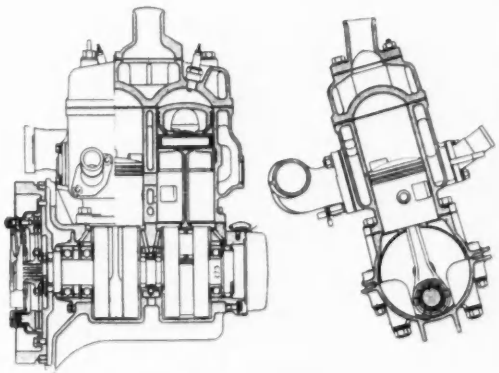
Four-passenger Saab-92.

used are of the direct-acting, hydraulic type.

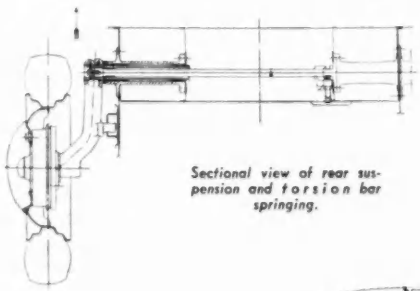
The two-stroke, two-cylinder, water cooled engine develops 25 hp at 3800 rpm. It has a bore of 3 5/32 in., stroke of 3 in., and compression ratio of 6.6 to 1. Piston displacement is 47 cu in.

A rack and pinion type steering gear is connected by links of equal length to the steering knuckle arms.

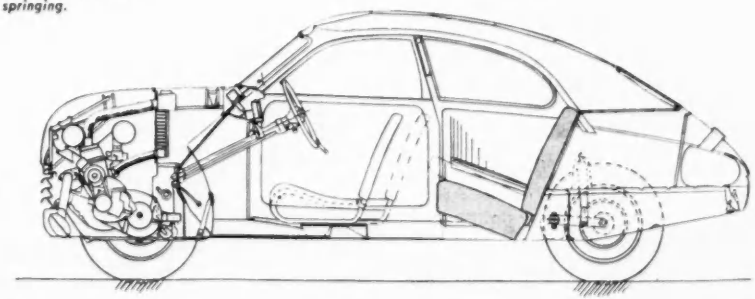
(*Turn to page* 65, *please*)



Longitudinal section and cross section of the two-cylinder, two-stroke engine.



Sectional view of rear suspension and torsion bar springing.



Outline drawing of the Saab-92 showing general arrangement of units.

Reo's New and E-22

Condensed Mechanical Specifications Reo Gold Comet Engine, Type OA

Type	Overhead valve
Bore	4 1/8 in.
Stroke	4 1/8 in.
Displacement	331 cu in.
Number of cylinders	6
Piston rings—number	4
Compression	2
Oil control	2
Compression ratio	6.4 to 1
Governed hp*	140 @ 3200 rpm
Maximum torque (lb ft)*	264 @ 1000 rpm 260 @ 2200 rpm
Number main bearings	7
Lub oil sump capacity (less filter)	8 qts.
Cooling system capacity	23 qts.

* These values given without fan or muffler.

DISCLOSURE of the basic design of a family of six cylinder heavy duty engines is found in the details of the new 331 cu in. "Gold Comet" engine released by Reo Motors, Inc. Eventually, the line will comprise three gasoline models—331, 292, and 255 cu in. displacement, the type OA, 331 cu in. engine being the first to be released for production.

At the same time, Reo announced that the Gold Comet will power the company's new E-22 truck series, which replaces the D-22 series, covering a weight range of 17,000 to 22,000 lb as a truck and 22,500 to 38,000 lb as a tractor.

The E-22 features a new truck design with a massive-appearing front end, modern lines, and increased driver comfort. The curved radiator grill has been blunted considerably, with chrome trimmings conforming to modern styling. The hood swings up from the line of the broad, one-piece bumper, exposing the entire engine, and fenders have been kept low to simplify engine maintenance.

Cab interiors have been improved, while the new Reo dashboard is in keeping with passenger-car appearance. Dials are grouped at the left side of the dash. A removable floor panel, between the door and the driver's seat, exposes the battery for checking and refilling.

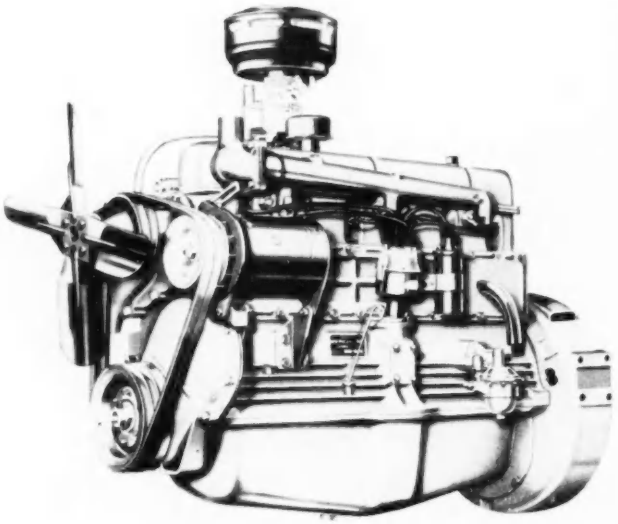
The frame is cold-riveted and is reinforced by the use of five extra-heavy cross-members, in the shortest E-22 wheelbase (130 in.), including a curved tubular steel support under the flywheel housing.

Returning to the Gold Comet engine, it is of overhead valve type incorporating wet cylinder liners. Interchangeability of parts and components has been carried to a remarkable degree. Although the basic engine is free from radical features of design, it is equally evident that the end product combines many of the latest developments known to the art into a balanced design of unusual modernity. In this respect the Reo engine is new in every sense and marks an important advance in heavy duty engine conception.

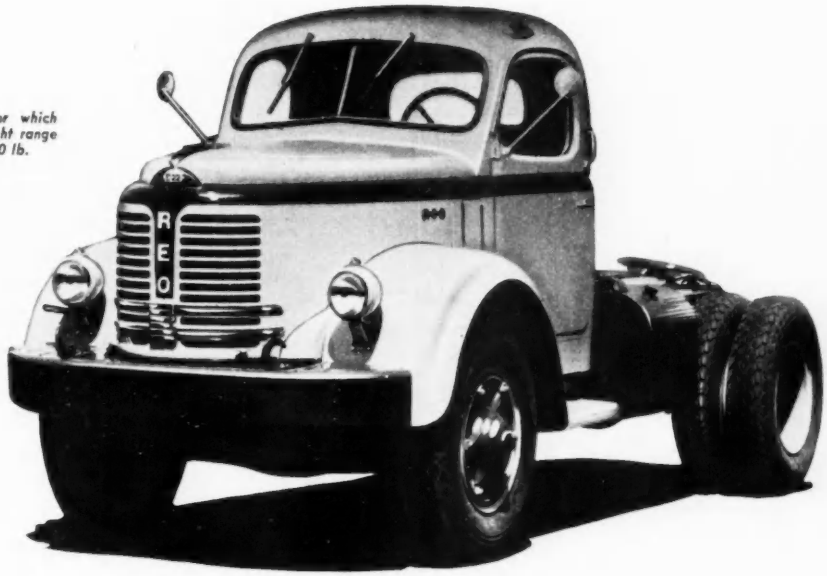
As an aid in visualizing the details of this engine, let us examine it by logical component sub-assemblies, referring to the assembly drawing for visual evidence.

The cylinder assembly starts with the wet sleeve which is inserted with light pressure into the pilots at the upper and lower ends of the block. The water seal at the lower end is provided by two Neoprene rings fitted into grooves in the sleeve. Sleeves are castings made of an alloy iron composition containing chromium, molybdenum, and copper. Hardness ranges from 229 to 269 Brinell as cast.

Pistons are of Lo-Ex aluminum alloy and bronze-



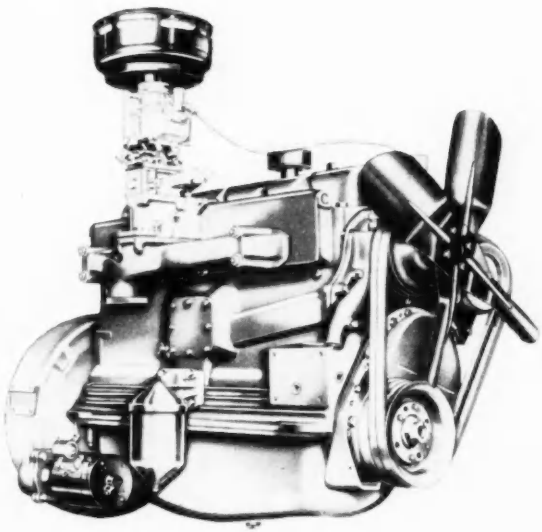
Left side of Reo overhead valve engine.



Model E-22 tractor which covers a gross weight range of 22,500-38,000 lb.

By Joseph Geschelin

Gold Comet Engine Series of Trucks

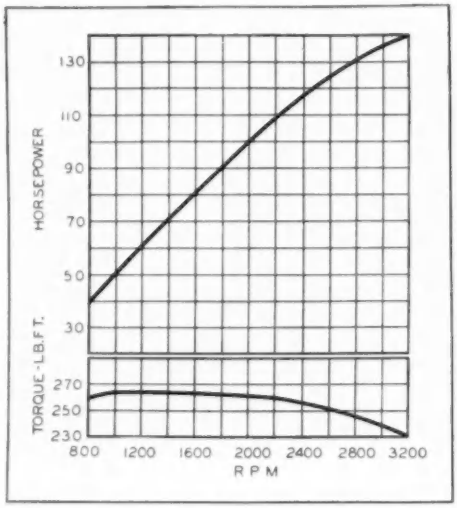


Right side view of Reo engine. The cover plate immediately above the low-mounted oil filter is at the point of application of an oil cooler when specified.

plated to reduce scuffing at break-in. They are fitted with two compression rings and an oil ring above the piston pin and an additional oil control ring below the pin. Compression rings are 3/32 in. wide, oil rings 3/16 in. wide. The piston pin is full floating. A unique feature of the piston is the concavely machined dome on the 331 cu in. model shown here.

Connecting rods are interchangeable for all models. They are fitted with a bronze bushing at the small end, and an interchangeable, precision type, steel-back, copper-lead alloy bearing at the crank end.

Both the piston and rod are machined to precise tolerances, particularly with respect to bore centers on the rod and the dimension



Power and torque curves for 331 cu in. Gold Comet engine. Compression ratio 6.4 to 1, fuel 75 octane.

from the center of the pin to the flat of the dome on the piston. Accurate control of these dimensions is essential to the control of clearance volume. In addition, both the rod and piston are made to common weights so as to dispense with selective fitting at assembly. This feature also simplifies the field maintenance problem.

Coming to the crankshaft assembly, the shaft is of seven-bearing type with integral counterweights and Tocco-hardened journals and pins. It is of interest that the shaft is dynamically balanced to a tolerance of ¼-oz in. In line with the general philosophy of interchangeability, all main bearings are of precision type, steel-back, with copper-lead bearing alloy. Main bearing caps also are alike in most respects. Such interchangeability is made possible by the adoption of a separate thrust washer at the front end instead of using the conventional main thrust bearing at the rear end. The thrust washer is of bronze, of semi-circular form, fitting into a machined surface in the block face at the front bearing. The crankshaft has drilled oil passages in conventional fashion for pressure lubrication. No shims or adjusting means are required to control end-play since the close control of tolerances on the crankshaft and block takes care of this feature.

Among the other features of the crankshaft line are the adoption of the now well-known Houde viscous vibration damper and the use of the familiar one-piece assembly Neoprene oil seals at the front and rear. The rear oil seal is particularly interesting because of its one-piece construction which is made possible by mounting the seal on the OD of the small diameter crankshaft flange.

The camshaft is of cast alloy and mounted in four bearings. The cam base circle is 1½ in. diameter, cam ramp opening being 0.010 in. at 20 deg, cam ramp closing 0.015 in. at 30 deg. Timing gear drive is by means of a steel gear on the crankshaft end and an aluminum alloy gear on the camshaft meshing with it.

Consider now the valve mechanism. An important feature of the cylinder head is that the casting also includes the intake manifold line as an integral part. As illustrated, the intake and exhaust valves are actuated from the camshaft by means of substantial pushrods which fit into a socket in the adjusting screw in the rocker arm at the upper end and within the tappet at the lower end. Attention is drawn to the fact that the tappets are castings of barrel type with an open end to permit seating of the pushrod in the bottom surface inside the tappet.

Intake valves are conventional, made of Silchrome and seating directly in the seat machined in the head metal. A Neoprene washer is provided at the valve spring end to prevent leakage of oil from the upper chamber into the valve guide. Valve guides are of alloy iron for durability.

On the exhaust side, valves are of sodium-cooled type and faced either with Eatonite or Stellite, depending upon the source of supply. At the same time an exhaust valve seat insert is employed and this is Eatonite or Stellite faced.

Intake valve head diameter is 2 in.; throat diameter, 1¾ in. Intake seat angle is 30 deg and intake lift 0.420 in. Intake timing—open 5 deg btdc, close 55 deg abdc. Exhaust head diameter is 1.800 in., throat diameter 1⅝ in. The exhaust seat angle is 30 deg, lift 0.420 in. Exhaust timing—open 50 deg bbdc, close 10 deg atdc.

Major Models in Reo E-22 Series

Model	Wheelbase
E-22-A	130 in.
E-22-T	130 in.
E-22-B	150 in.
E-22-C	170 in.
E-22-L	185 in.

The cylinder block, which constitutes the backbone of the structure, is an integral casting of alloy iron, and is compact and extremely rigid in construction. It may be noted that the crankcase parting line is on the main bearing center line, the oil pan being a stamping. This design imposes still greater duty on the cylinder block structure and it will be found that a row of horizontal ribs is employed on each side in the regional directly above the parting line to provide added rigidity. The powerplant suspension system is of three-point type with two brackets on the flywheel housing at the rear and two closely spaced feet under the front end.

The ignition system consists of 6-volt heavy duty units of latest type supplied by Delco-Remy. As

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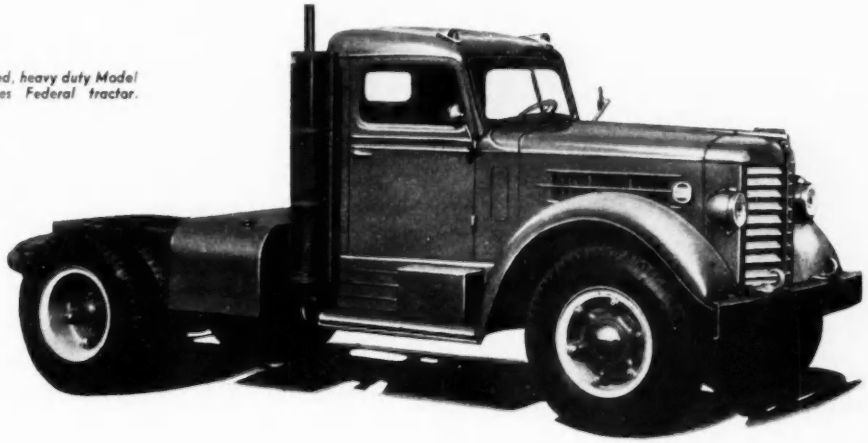
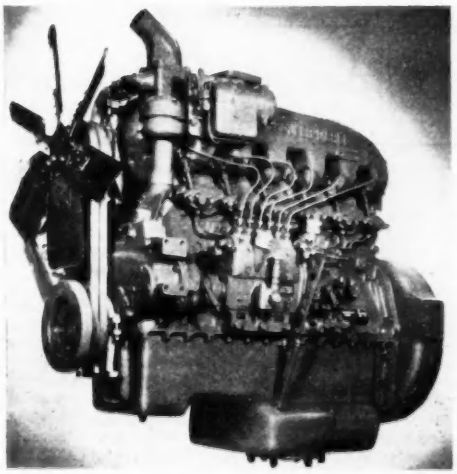


High speed, heavy duty Model D45 series Federal tractor.

Federal Brings Out Two Series of Diesel Powered Trucks

TWO new high speed heavy duty Diesel series trucks comprising five models in the medium price field of both conventional and six-wheeler design have been introduced by the Federal Motor Truck Co.

Production is already underway on the new D45 and D645 Diesel series. All of the Diesel models will be powered with a light weight, high speed, heavy duty Federal-Hercules Model DWXLD Diesel engine with a 4¼ in. bore and 5 in. stroke and a piston displacement of 426 cu in. The engine develops 142 hp at 2600 rpm and has a gross torque of 332 lb ft., at 1700 rpm. An important characteristic of this engine is its high operating speed corresponding with gasoline engines of similar displacement. It has been primarily designed for fast motor transport.



Federal-Hercules Model DWXLD Diesel engine.

One of the outstanding features of this new power plant is that it weighs only 485 lb more than the present gasoline engines now standard for Federal models in this classification. The engine is of solid injection, compression ignition, four-stroke cycle type. Another feature of this Diesel is the readily replaceable dry sleeve pressed into the cylinder bore. It is equipped with a seven-main bearing crankshaft with Tocco-hardened crank pins and main journals.

The D45 series will be available in three models with a choice of single speed or two-speed double reduction rear axles. These models have a nominal rating of 3½ to 5 tons, a gross vehicle rating of 26,000 lb and a gross combination weight of 50,000 lb.

The D645 six-wheeler series Diesel, now available in addition to the D45, has a gross vehicle weight of 38,000 lb. It is offered in two models with a choice of a tandem double reduction or worm drive rear axle. For service where maximum gear reductions are required, auxiliary transmissions are available for these models.

Both the D45 and D645 Diesel series units are equipped with 10.00-20 tires, with larger tires available. Air brakes are standard as is a front wheel

(*Turn to page* 65, *please*)

A big crowd of SAE members and townspeople witnessed the automotive circus at the French Lick airport, featuring a cavalcade of new passenger cars, truck roadeo, helicopter and model jet plane demonstrations. Indiana roadeo champions demonstrated their driving skill with a truck and tractor-trailer. In this photo is shown the large trailer that has been backed into position between two trailers with four in. to spare on each end.

SAE

By James R. Custer

PRESENTATION of the latest developments in compound engines and automatic transmissions was a major feature of the big summer meeting held by the Society of Automotive Engineers early in June at French Lick, Ind. In attendance during the six days were over 1100 SAE members and guests, the largest summer meeting in the history of the society.

The program was crammed with activities—25 technical meetings, family dinner party, automotive circus, 32 committee meetings, sports, and social gatherings. The technical meetings included 16 round table discussions, which were tried for the first time and proved to be quite successful. All were "off the record" sessions, therefore nothing can be reported here as to what was said by the top ranking engineers who participated in them.

Discussion of high compression engines always produces diverse points of view, so this year's SAE program had one of the round table meetings devoted to mechanical versus chemical octane numbers in high compression engines. Because of the intense interest, a series of articles will be published in AUTOMOTIVE INDUSTRIES on the subject, "High Compression without High Octane Fuel," the first of which appears in this issue. During the meeting a new Vitameter was demonstrated on an Oldsmobile powered by a Rocket engine with a 10 to 1 compression ratio. It is sensitive to car speed and manifold vacuum, which is said to give better economy of the Vitane fluid.

Fifteen papers were read at nine technical meetings and abstracts of most of them are included with this article. There was a symposium on corrosion featuring three papers. F. L. LaQue and E. J. Hergenroether, of the International Nickel Co., discussed corrosion in automobile bodies, engine cylinders, cooling systems, cylinder liners, mufflers and tail pipes, and what can be done to control it. H. A. Pray, Batelle Memorial Institute, reported on a series of corrosion tests with electroplated coatings. Aluminum cylinder head corrosion problems were analyzed by M. W. Daugherty and R. F. Koenig, of the Aluminum Co. of America. At the final technical meeting Willard H. Farr and George E. Coxon, of the Stewart-Warner Corp., discussed instrumentation for heavy duty service in trucks and buses, urging close cooperation of prospective purchasers with instrument manufacturers' sales representatives in explaining fully the conditions under which the equipment is to operate.

AUTOMATIC TRANSMISSIONS

Packard Automatic Transmission

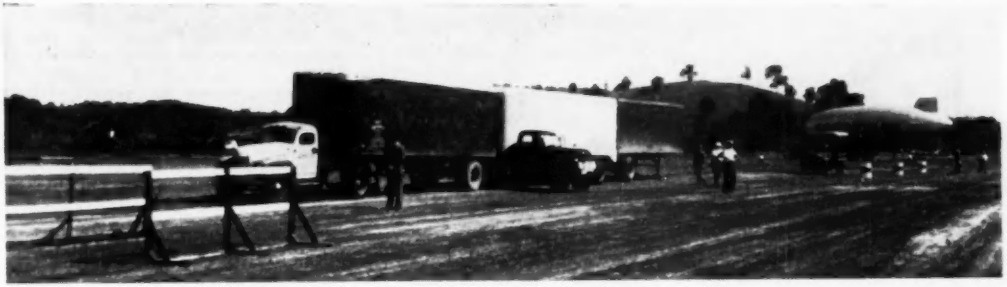
By Col. J. G. Vincent,
Vice President of Engineering,
and Forest McFarland,
Chief Engineer, Research Div.
Packard Motor Car Co.

OUR first step in the converter development was the design and construction of a converter of the conventional three-unit type. The performance of the completed unit agreed very closely as to torque and speed with the calculated results. The immediate drooping of the pump speed from the stall value, and the short span of the conversion range, immediately gave rise to an intensive study and development program. The characteristics desired were a reasonably low stall speed, a satisfactory stall torque, a sharply rising pump speed curve, and a turbine coupling point extended well out on the turbine speed curve. A reasonably high efficiency and a fair degree of quietness were also desired.

Analytical study and development work resulted in the present design, which has a performance pattern as shown in Fig. 1. It will be noted that all of the objects desired have been attained to a satisfactory degree.

The size of the unit may doubtless surprise many. The outside diameter of the mean path of flow is ten inches. Our analysis and test results indicated that pump blading, substantially radial, was one of the design features desirable to maintain proper flow and extend the coupling point of the unit. The design of the pump and that of the blading in the other members established the size shown to obtain the desired stall speed.

The two-stage turbine construction is of special interest. This arrangement, along with other design considerations, have resulted in the obtaining of a steeply rising engine speed curve with the resultant extended coupling point. The location of the blading of the second turbine has the effect of assisting the pump in developing the necessary hydraulic head to obtain the necessary rate of flow of the fluid. The type of pump speed curve is felt to be most pleasing to the driver since increase of engine speed with increase of car speed is not felt to be as noticeable as a high initial stall speed.



Analyzes Latest Engineering Developments

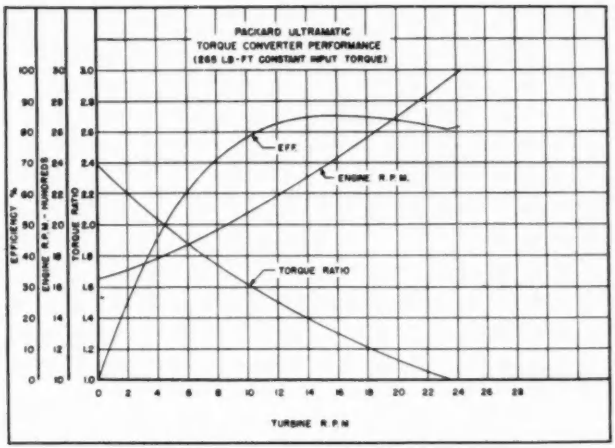


Fig. 1 — Torque converter performance of Packard Ultramatic transmission (265 lb-ft constant input torque)

Hydrodynamics of the Hydraulic Torque Converter

By Ernest W. Spannhake

THE analysis shows that the limit in the development of this machinery has not been reached by far. In order, however, to go on intelligently from here a combination of analysis and experiment has to take over. There is far too much in a torque converter which is unknown to us and can only be found by experiment. Very little is known about the actual change in discharge, although some tests have been run to determine it. However, there is almost nothing known about the distribution of velocity between outer and inner streamline. Free vortex values and their dependence upon blade warp and discharge, correct values of friction losses, shockloss distribution over streamlayers and many others also come under this heading. Even a superficial study of these factors should pay large dividends in increasing operating range and effective stalling torque ratios, and even peak efficiency of our torque converters. Because of the expense involved it would be an interesting thought to consider whether such a research program, which would benefit everybody in the industry, could not be undertaken by the whole torque converter industry jointly.

A number or torque converters with widely varying characteristics are in the field at the present time. Since the object of most of them is to replace a multiple step gearbox, it seems appropriate that some means should be found for comparing torque converters of various performance characteristics as to their relative merit.

Fig. 2 shows the performance characteristics of a typical low speed-high torque converter. Ts/Tr signifies the torque ratio, η the efficiency, ns/np $=i$ the speed ratio between output and in-

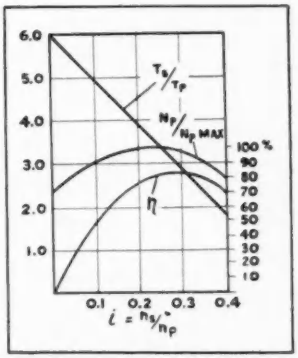
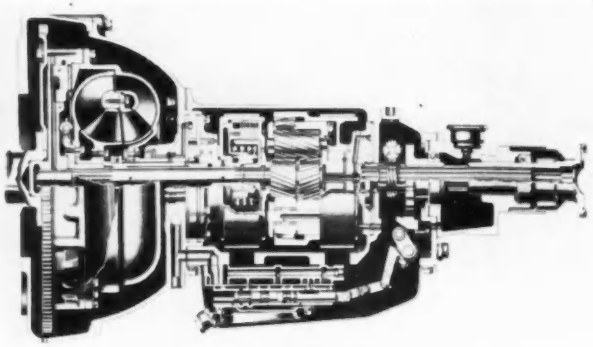


Fig. 2 — Slow speed — high torque converter



Cutaway view of Packard automatic transmission, a description of which was presented in the May 1 issue of Automotive Industries.

put shaft and Np the primary load for a constant speed. As highest speed ratio i = .4 is chosen. Fig. 3, on the other hand, gives a characteristic picture of a typical high speed-low torque converter with the same lettering signifying the same magnitudes. Here the highest speed ratio is $i = .8$. By themselves and as single units, it is obvious

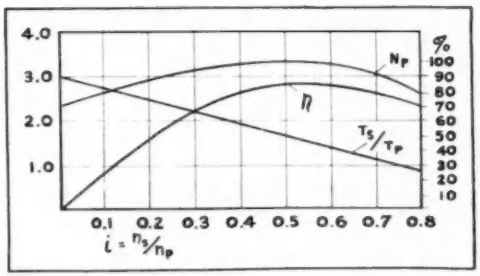


Fig. 3—High speed—low torque converter

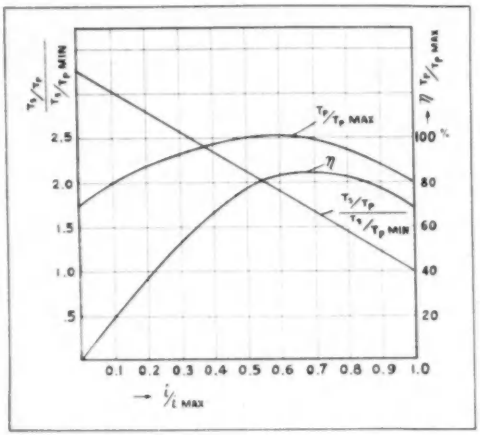


Fig. 4—Unit diagram of converters in figures 1 and 2

that these two converters give an entirely different performance.

It seems highly advantageous for the purpose of comparison to plot the performance characteristics of different torque converters in the shape of a unit diagram, preferably in such a way that Torque Ratio as a fraction of the highest operable one, efficiency and primary load are plotted against speed ratio as a fraction of the highest operable one. In Fig. 4 such a unit diagram is shown. Since for most applications an efficiency of less than 70 per cent for the torque converter alone will mark the upper limit of operable speeds, a good definition of maximum speed ratio would be the one where the torque converter efficiency drops below 70 per cent. All speed ratios are thus plotted as fractions of this critical speed ratio and all torque ratios as fractions of the torque ratio at this point. As examples the Torque Converters of Fig. 2 and 3 are chosen, whose unit diagrams are exactly alike.

From this unit diagram several characteristic numbers can be taken, which can help in picking the right converter for the right job. One certainly is what might be called the operating range. In other words, the range of speed ratios in which the efficiency stays above a minimum tolerable efficiency, in this case 70 per cent. The other is the effective stalling ratio, this means the operating stalling torque ratio divided by the torque ratio at the maximum operating speed. Another ratio which should be interesting is the primary torque ratio which will be given as fraction of the maximum primary torque at operating speed. One could also establish what might be called the overspeed ratio. That is that speed that can be achieved (of course at rather bad efficiencies) until the output torque goes to zero, at which point, of course, the efficiency is zero also.

From the above discussion it is apparent that a wide variety of torque converters can be fitted into the described unit diagram. It is interesting to note that present day torque converters do not differ too widely from each other when plotted in this fashion.

COMPOUND ENGINES

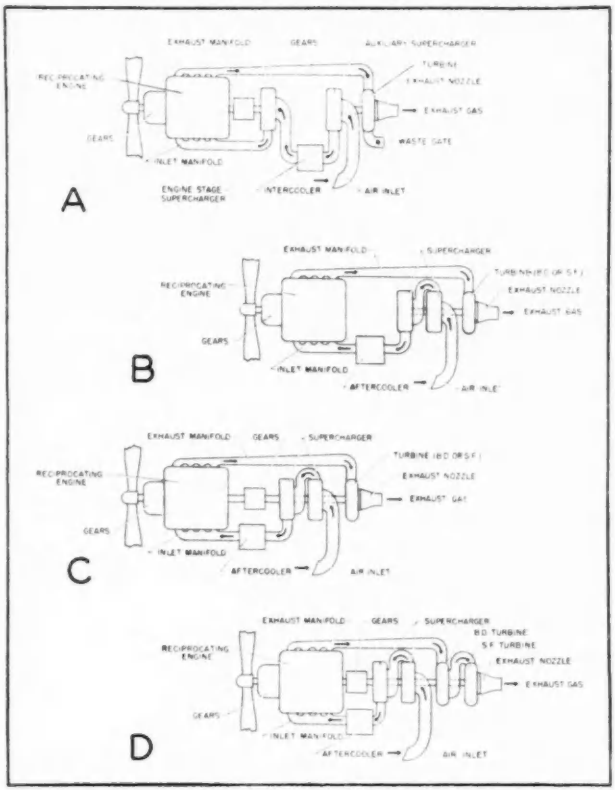
Compound Power Plants

By Prof. P. H. Schweitzer,
The Pennsylvania State College,
and J. K. Salisbury,
General Electric Co.

BECAUSE the number of possible arrangements of compound power plant is tremendous, only three promising types are selected. Best fuel economy can probably be obtained by the free piston or the semi-free piston hot-gas generator (sometimes called the controlled-piston type) operating at approximately 6 to 7 atmospheres supercharge, under the balanced cycle.

The difference between the free-piston and semi-free piston machine is more a matter of convenience than of

Compound Reciprocating Engine Systems



(A) Conventionally turbosupercharged engine
(B) Completely turbosupercharged engine
(C) Geared turbine (Blowdown or steady flow turbine)
(D) Geared blowdown and steady flow turbine

principal nature; a matter of mechanical design rather than thermodynamics. Substantially the same specific fuel consumption should be attained. At a supercharge ratio of seven, the sea-level fuel consumption would be around 0.41 per bhp-hr with a steady flow turbine and around 0.37 lb with partial blowdown recovery which appears to be practically feasible and certainly highly desirable. At altitude the fuel economy is still better.

The next poorer plant in expected thermal efficiency is the two-stroke cycle Diesel engine, with geared turbine and blower, operating with two to three atmospheres supercharge. Spark ignition engines with this arrangement are being developed by American aircraft engine manufacturers. Weight and specific fuel consumption probably could be reduced by using the smaller and more efficient two-stroke cycle Diesel.

An alternative version of this arrangement dispenses with the mechanical connection between engine and turbine-blower, so that all of the turbine power is absorbed by the supercharger. This arrangement is simpler and, according to one study, only slightly less efficient than the geared arrangement. Estimates of fuel consumption are 0.4 and 0.42 lb per bhp-hr for the all-geared and the floating turbocharger, respectively. The net specific power output would be approximately 1.2 hp per cubic inch of cylinder displacement.

In the compound power plants described so far a turbine has been attached to an engine. The process can be reversed by starting from a turboprop power plant and attaching an engine to it. The emphasis is left on the turbine, thus minimizing engine development. In Fig. 5 the heavy lines show a schematic diagram of a conventional turboprop power plant geared to a propeller. The turbine has a conventional combustor where the fuel is burned with the customary 300-400 per cent excess air, to keep the final gas temperature below the permissible limit. Light lines on the figure show an engine also geared to the propeller and arranged in parallel with the air line between blower and combustor. The two-stroke cycle loop-scavenged spark-ignition engine, supercharged by air from the blower, exhausts into a venturi at the entrance to the combustion chamber. Part of the total fuel supply is burned in the stationary combustor, and part of it is burned in the engine, thus producing part of the power at higher efficiency than in the simple gas turbine.

The balance sheet for this arrangement looks favorable. The turbine power plant is left substantially unchanged so that special development work on the main part of the power plant can be saved. The proportion of engine gases to compressor air may be limited by the inlet temperature to

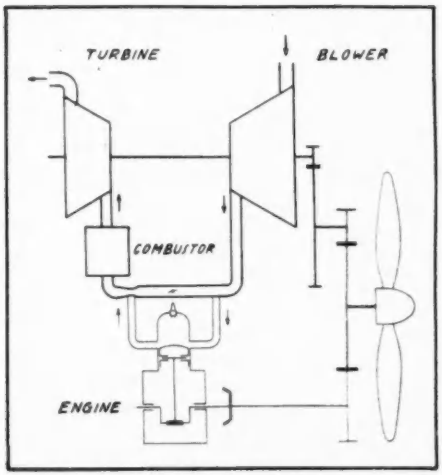


Fig. 5—Turbine compounded with two stroke cycle spark ignition engine

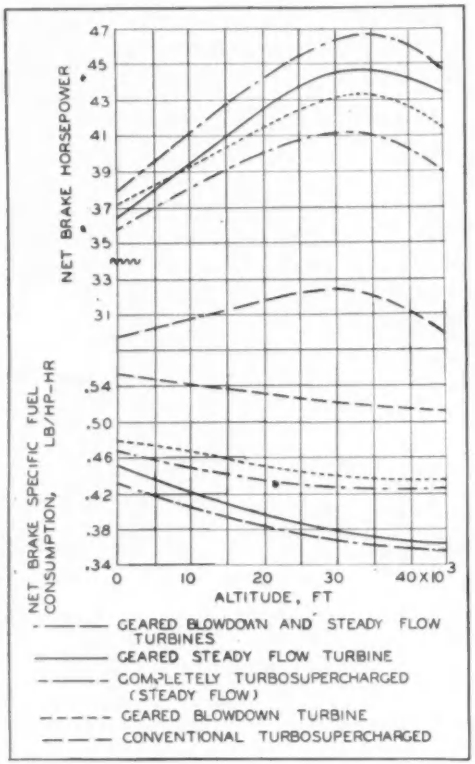


Fig. 6—Effect of altitude on net brake power and specific fuel consumption of compound engine systems at rated power level. Flight speed 400 mph.

which the combustion chamber can be subjected, although if this becomes a serious limitation, engine exhaust can be introduced directly at the turbine nozzles. Considerable development work has been done on such an engine during the war by the K.H.D. concern in Germany.

The engine may also serve as a starter for the turbine power plant, thus avoiding the extra weight of a reciprocating engine used for starting only. The proportion of the power generated by the engine can be small or large, depending on which characteristic of the power plant emphasis is placed. If emphasis is on compactness the engine need not be larger than required for starting. If, on the other hand, emphasis is on fuel economy, the engine may develop a substantial proportion of the total power. The ratio can be changed in flight by a butterfly by-pass valve in the air duct used to divert air into the engine for take-off or acceleration.

Compound Engine Systems for Aircraft

By E. J. Manganiello,
L. V. Humble
and D. S. Boman,
National Advisory Committee
for Aeronautics

CONSIDERABLE improvement in engine power and fuel consumption and in airplane range and payload can be achieved by compounding the spark-ignition reciprocating engine. The improvement in performance increases with the degree of compounding and attendant increase in complexity of the system. The compression-ignition compound engine offers possibility of appreciable gains over the spark-ignition systems, however, it is anticipated that a greater amount of development time will be required for the practical realization of the predicted performance of the compression ignition system than of the spark ignition engine.

The variation with altitude of the net power and specific fuel consumption of the compound engine systems is shown in Fig. 6 for rated power level at 400 mph.

The load-range characteristics of the compression-ignition compound engine system are compared with those of the spark-ignition geared steady flow system in Fig. 7 at an altitude of 30,000 feet and a flight speed of 400 mph. Two curves are included for the spark-ignition engine, one for operation with standard AN-F-28 fuel and one for operation with a 50 per cent better fuel.

Improvement in fuel grade increases the ultimate range of the spark-ignition system from 8800 miles to 9200 miles and increases the payload about 0.015 lb per pound of airplane gross weight. With the compression-ignition compound engine ultimate range is 11,500 miles and payload is between 0.04 and 0.1 lb per pound of airplane gross weight above that of the spark ignition engine with standard fuel.

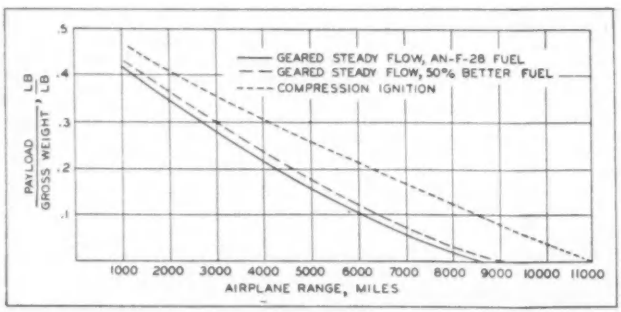


Fig. 7 — Comparison of payload and range of compression ignition and spark ignition geared steady flow systems. Altitude 30,000 ft; flight speed 400 mph.

Free Piston Gas Generator Brightens Gas Turbine Future

By L. F. Small,
Lima-Hamilton Corp.

THE peculiarities of the free piston motion also contribute to the superlative efficiency of the gasifier-turbine combination. The frequency of it rises with decrease in piston weight with consequent increase in gasifier output and horsepower of the turbine. But lower weight of piston also causes its greater acceleration under the impact of pressures developed by combustion so that the temperature of the gases drops faster during the early part of the stroke and less heat is lost to cooling medium with consequent improvement of thermal efficiency. Efficiencies

well above 40 per cent have been obtained by the Pescara group and on our test stand.

What has been accomplished to date in the development of the Free Piston Unit? The French Pescara group has built a number of gasifiers of several designs, vertical and horizontal, symmetric and asymetric in the arrangement of compressors. Their latest type has many admirable design features which contribute to its simplicity and to its reliability of performance.

Sulzer Bros., for instance, built a 7000 hp gasifier-turbine plant suitable for merchant ship propulsion, thoroughly tested it, and decided that it would be unable to compete commercially with the more conventional type of gas turbine plant. Pratt & Whitney spent much money and effort developing a gasifier-turbine plant for aircraft propulsion, but came to the conclusion that the difficulties offered by operation above 20,000 feet elevation required too much research and laid it aside temporarily to switch to a less efficient solution more promising of immediate results. Several similar British developments are reported to be in a state of "suspended animation."

The Lima-Hamilton Corporation and the Pescara group in France appear to be the principal active exponents of the gasifier-turbine combination as the most efficient way of producing power and potentially the most compact and light plant, which eventually will be proven thoroughly reliable and competitive in outputs from about 1500 to 20,000 hp, yielding to the Diesel engine below that range and to the steam turbine above it.

maintain its sea level power to much higher critical altitude than the turbojet or turbo-propeller engines because of their operating temperature limitations, and lack of supercharging.

The Wright Aeronautical Corp., in addition to its turbine and ram jet developments, is currently studying designs of more advanced reciprocating engines. The engine types are as follows in order of their general desirability:

1. The blowdown system of power recovery is considered the most efficient and most readily adaptable improvement, allowing 20 to 30 per cent increase in power and accompanying decrease in fuel consumption (see Fig. 8).

2. The blowdown system of power recovery with an internally located aftercooler is considered a logical step to permit increased horsepower for takeoff and high altitude operation at the least increase in power plant weight. This design will permit an additional increase in 15 per cent in takeoff power with no increase in weight per horsepower as compared to the present "blowdown" engine.

3. The combination blowdown-pressure system of power recovery is a natural development that utilizes the internal engine aftercooler noted previously to overcome the effect of exhaust back pressure brought about by pressure compounding. This system will extend sea level powers to much higher altitudes, but will increase the engine weight per horsepower ratio.

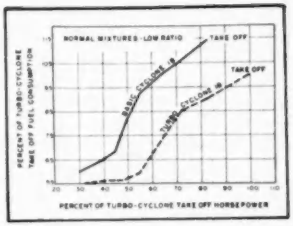

NORMAL MIXTURES - LOW RATIO
TAKE OFF
TAKE OFF
PERCENT OF TURBO-CYCLONE TAKE OFF FUEL CONSUMPTION
PERCENT OF TURBO-CYCLONE TAKE OFF HORSEPOWER

Fig. 8 — Perfrmance comparison of engine before and after compounding.

4. The use of increased diameter cylinder bore with any of the aforegoing engines would create basic piston engine development problems, but is a logical step towards weight per horsepower decrease of 5 to 10 per cent, and economy improvement of 10 to 15 per cent.

The selection of any or all of these engines for development completion can only be determined by the expressed need for this type of powerplant for future aircraft. Three to five years are required to design and develop a new engine and an investment of considerable proportions is involved which must show an economic return. All of the engine models described have the fortunate attribute of being pyramid developments which can follow each other for a minimum investment of time and money.

Compounding the Piston Engine

By F. J. Wiegand,
Engineering Manager,
and M. R. Rowe,
Project Engineer,
Reciprocating Engine Division,
Wright Aeronautical Corp.

At the present, if the design required is for very high speed operation with economy an unimportant consideration, the piston engine is out of place and affords no benefits that cannot be better handled by turbo-propeller, turbo-jet, ramjet, or rocket power plants. For present and near future years, however, it does not appear that jet powered transports will be able to fly payload economically for long distances. The application of jet engines to this field of long range flight must wait the discovery and development of better materials and design principles or much cheaper fuels.

In the lower than 500 mph field of aircraft operation, the piston engine offers the advantage of being able to fly with 25 to 50 per cent less fuel consumption at optimum cruising conditions than existing turbo-propeller or turbo-jet engines. Future possible improvements in fuels and materials can widen this economy difference considerably. Also, the piston engine can

OTHER SAE ABSTRACTS

Effect of Lubricating Oil Viscosity on Engine Performance

By J. W. Lane,
Mgr. of Automotive Div. Lubricating Dept.,
Socony-Vacuum Oil Co.; and
D. S. Chatfield,
Tech. Service Dept.,
Socony-Vacuum Laboratories.

The effects of oil viscosity on the engine factors selected may be summarized as follows:

Oil Consumption — In general, the higher the viscosity, the lower the consumption. Consumption differences between grades become more pronounced as engine mechanical condition deteriorates.

Two 6-cyl passenger car engines were used in the laboratory consumption tests: A 1940 model in poor mechanical condition after running 75,100 miles in an automobile, and a newly rebuilt 1942 model which had been used solely for laboratory work. Two series of tests, approximately a year apart, were run on the former; and one series on the latter. The engines were not disturbed mechanically during any one series of tests.

Tests were of 10-hr duration each. Cooling water outlet temperature was held at 170 F, but no attempt was made to hold oil temperature at any predetermined level. In the interests of securing maximum reliability of consumption data, the drain plug was removed after each test while the engine was still hot and the oil was allowed to drain for a period of one hour.

Consumption figures were reduced to a ratio basis, using the consumption of the SAE 10 grade as unity in each

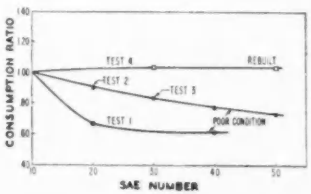


Fig. 9 — Oil viscosity vs. consumption ratio — 6 cycle car engine.

case. This eliminated any variations due to use of different speeds for the different series of runs. The speed, of course, was held constant during the several runs made to compare consumption of the oils of different viscosities comprising any one curve.

Fig. 9 indicates the results obtained with oils SAE 10 through 50. Tests 1, 2, 3, for the older engine, show a definite reduction in consumption with increase in viscosity. Consumption ratio varied appreciably from one series of tests to another, as is apparent from the spread between Test 1 curve and the curve for Tests 2 and 3. This may be ascribed to the poorer condition of this engine during test run No. 1.

The curves for Tests 2 and 3, derived from a series of runs at two different speeds, coincide. Actual consumption, as is to be expected, was higher at the higher speed, but the employment of the idea of relative consumption, mentioned above, results in these two curves becoming identical.

Test 4 refers to the rebuilt laboratory engine. The curve obtained indicates that oil viscosity within the range used has very little effect on consumption in this engine, because of its good condition. Since only one engine is involved, such a conclusion obviously should not be applied generally.

Engine Temperatures (Sump and Main Bearing)—Both sump and main bearing temperature increase as oil viscosity increases. At the higher viscosities, particularly the SAE 50 grade, temperatures become excessive in new and newly-rebuilt engines.

Friction Horsepower — The friction horsepower increases slightly as viscosity increases. However, the small loss in power output resulting would not be noticeable in actual car operation.

Engine Wear—In the range of viscosities usually employed, mechanical wear is apparently not affected by oil viscosity differences. Use of the very light 5W grade tends to result in increased wear of piston rings at high temperatures, but is entirely satisfactory for the temperatures for which it is recommended.

Oil Deterioration — The lower the viscosity, the faster the rate of deterioration (oxidation) under identical operating conditions. However, oil contamination as expressed by per cent PE insolubles appear to be independent of viscosity. It is dependent principally on length of service and, to a lesser extent, on operating temperature.

Gas Turbines in Automobiles

By W. A. Turunen,
Research Laboratories Div.,
General Motors Corp.

INSTALLATION of gas turbines for automobile power appears to present the following handicaps:

1. Fuel consumption is high, especially at part throttle.
2. Controls and limiting devices must be developed to insure safe operation.
3. Space requirements appear large.
4. Lower first cost is questionable.
5. Lower maintenance cost is doubtful, especially if high operating temperatures are used.
6. Exhaust might be objectionable.
7. The turbine performance is sensitive to changes in ambient temperature.
8. A separate device to produce braking torque might be required.
9. Silencing might present a difficult problem.
10. A large reduction gear ratio would be required.
11. The automobile power requirements are too low to show the turbines to their best advantage.

In summarizing the desirable features of the turbine in an automobile installation the following are generally listed:

1. The turbine produces maximum torque at standstill with uniform variation to maximum speed.
2. A transmission with only one ratio change would be required.
3. A clutch mechanism might not be required.

However, these features are also realized when a conventional engine is equipped with an automatic transmission unit similar to the General Motors Hydramatic transmission, or the General Motors Dynaflow torque converter. The turbine appears to offer the following advantages:

1. Operation with a wide range of fuels would be possible.
2. The absence of power impulses would probably reduce the vibration problem.
3. The lubrication problem may be simplified.
4. Electric ignition is required only for starting.

Service Tests Solve Aluminum Cylinder Head Corrosion Problems

By M. W. Daugherty, Chief,
and R. F. Koenig, Research Metallurgist,
Cleveland Research Division,
Aluminum Co. of America

RECOMMENDATIONS to prevent the corrosion of aluminum cylinder heads can be briefly summarized as follows:

(1) The cylinder head alloy should contain not more than 0.4 per cent zinc, and at least 3.0 per cent copper, in order to provide a satisfactorily low electrode potential.

(2) The cylinder head should be used in the as-cast or solution heat-treated condition.

(3) Cylinder head gaskets should be of a protective design. Terneplate, stainless steel, lead, or copper are recommended as suitable materials for the ferrules or grommets.

(4) Radiator cores should be made of 65-35 yellow brass as usual rather than of copper or red brass.

(5) The use of an aluminum cylinder block will practically eliminate aluminum cylinder head corrosion so that most of the above recommendations become unnecessary.

(6) A 1 to 1 dilution of any reputable proprietary ethylene glycol solution is recommended as an antifreeze, but more dilute glycol solutions and alcohol antifreezes can be employed with satisfaction if the recommended alloy and gasket design are used.

(7) Where an inhibitor must be added to water to reduce rusting of the iron block and consequent radiator clogging, one per cent of a naphthenic base soluble oil should be used. Chromates or dichromates should never be used.

(8) Cleaning and "neutralizing" compounds used in cooling systems should be thoroughly flushed out.

(9) Chlorides should be avoided by cleaning the cooling system well at the factory, and later by avoiding high chloride water supplies.

(10) The cylinder head stud holes should be 1/16 in. greater in diameter than the studs, instead of the usual 1/32 in. or, cap screws should be used instead of studs.

An Evaluation of Present Trends Toward Larger Power Plants

By Merrill C. Horine,
Sales Promotion Manager,
Mack Manufacturing Corp.

HORSEPOWER has steadily increased in motor trucks and tractors ever since the early beginnings of the industry and at a rate appreciably greater than increases in gross weights. Consequently the net result has been progressive increases in horsepower per ton of gross weight. This trend toward greater power-to-weight ratio in trucks has been unfaltering for the past 30 years or more and shows no signs as yet of levelling off. Yet surely the time must come when further power increases will cease to pay. To speculate on just at what point this levelling off will occur requires that consideration be given to the objectives sought in the persistent upward trend.

It is much too early to predict what part, if any, the gas turbine will play in the automotive drama. The steam engine, on the other hand certainly represents the acme of simplicity, can be built exceedingly compact and light in weight and possesses torque and power characteristics far superior to any internal combustion engine. Unfortunately, though, the steam engine is not a powerplant; but merely a means of power transmission. Until the problem of steam generation moves far closer to solution than it has ever approached, the steam engine must remain unadaptable.

Short of such extreme measures as these, much has been done and will be done to increase the power output of engines within convenient size and

(*Turn to page* 65, *please*)

High Capacity Fuel Pump Has Six Valves

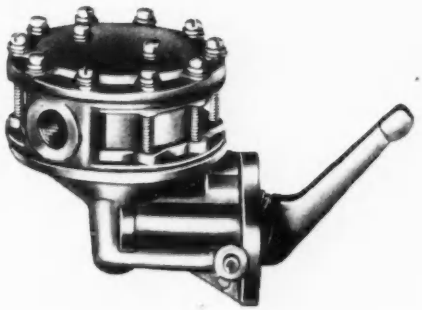
A SIX valve fuel pump, developed by AC Spark Plug Division of General Motors, is now being used as standard equipment on GMC Truck and Coach Division's new line of heavy duty trucks.

The six valve pump was originally designed for use on tanks and has since found wide use on engines of 250 hp and over.

Early in the Libyan phase of the war the British encountered trouble with "vapor lock" in their tank engines. To eliminate this trouble, AC made up some 250 experimental fuel pumps and flew them to Libya. The six valve type proved to be the answer, and later was used on all Sherman tanks.

As its name indicates, this pump is equipped with six valves, three intake and three outlet. AC engineers say the pump has a capacity up to 200 gph, depending on the size of the tubing from the supply source. It has a static pressure of four psi minimum to five and one-fourth psi maximum at 16 in. above outlet when pump is operating at 1800 rpm.

Unique to this pump is the pulsating diaphragm above the valve, making two chambers, one for suction and one for pressure. The pulsating diaphragm takes the hard surge out of the fuel flow by steadying the action of the valves. Steadying the action of the valves has also increased the pump capacity, assuring a constant flow of fuel to the carburetor.



Six valve AC fuel pump.

Premium Gasoline Required by Large Percentage of Cars

By Julian J. Frey,
General Sales Manager, Ethyl Corp.

WE all know, in general, the importance of premium gasoline to cars. The compression ratios of present-day automobile engines are such that gains in power can be realized in most cases, provided engines are adjusted to take advantage of premium gasoline. With premium gasoline, the motorist experiences these gains in faster starts, quicker pick-up, more power on hills, and more miles per gallon.

But it is not generally realized that a great number of cars on the road actually require premium gasoline for best performance. This is borne out by a number of important surveys, made since the war, of the octane number requirements of the present car population. Three of these surveys, which were conducted

(*Turn to page* 65, *please*)

Octane Number Requirement in Terms of Primary Reference Fuels

Per Cent of Cars Satisfied	Socony-Vacuum Survey	Shell Survey	Ethyl Survey	Average
40	74	77	76	76
50	76	79	78	78
60	78	81	80	80
70	80	83	82	82
80	82	86	85	84
85	83	87	86	85
90	85	89	88	87
95	88	92	90	90
99	90	96	93	93

NEW

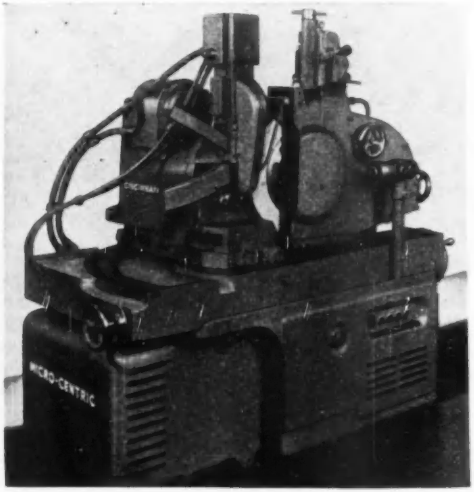
Production and Plant

EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

E-1—High Production Grinding Machine

A new high production grinding machine — the Micro-Centric — developed by Cincinnati Grinders Inc., Cincinnati, Ohio, meets requirements of the precision anti-friction bearing industry, and can also be used to grind numerous parts requiring similar standards of accuracy. Employing a new principle of work support and rotation, the machine will, without centers or a chuck, hold roundness well under 0.000025 in. The work is located, rotated and supported so that the ground dia can also be held square with a pre-finished face well under 0.000025 in. accuracy. Fundamentally, Micro-Centric grinders are built to handle work that has a large dia in relation to the length.



Cincinnati Filmatic Micro - Centric grinding machine available in models No. 1 and No. 2

The grinders are made in two sizes, number 1 and number 2, and can be built for full automatic operation or for hand loading. The No. 1 machine grinds work dia from ¾ in. to 3½ in., either automatic or hand loading; the No. 2 machine handles pieces from 2 in. to 4 in. dia automatic loading, or 2 in. to 8 in. dia when hand loading. Pieces above 4 in. dia can usually be handled faster with hand loading than with automatic loading, it is claimed. One operator can feed two to four fully automatic machines, or one to two hand loaded machines.

Machines operate by a method wherein the grinding wheel head, pivoting on a trunnion under the wheel spindle, is rocked forward into grinding position through a definite preset cycle. The cycle develops in four phases — load, rapid advance, feed and dwell, retraction and unload. Each phase can be individually controlled.

Rapid advance movement, regardless of workpiece dia, can be varied from 0 to 1¾ in. and the infeed movement from 0 to ⅜ in. This amount of movement provides ample clearance around the headstock when loading by hand and allows "air grinding" to be reduced to a minimum when grinding fully automatic.

Approximate setting of the wheelhead in forward position is accomplished by adjusting a locked cam at the rear of the unit. This cam also serves as a positive stop for accuracy of repetitive sizing by limiting forward oscillation of the wheelhead. Final close grinding adjustment is made by positioning the cross slide on which the headstock is mounted.

The combined infeed and tarry time can be varied, by means of an electrical time delay relay, from 3 to 60 seconds. The infeed rate of grinding can be varied from a low of 0.0005 in. per min to a high of 1 in. per min.

Micro-Centric grinders are primarily infeed machines, no provision being made for traverse grinding,—although a grinding wheel reciprocator is available.

On standard machines, the headstock and work holding fixture are mounted on a swivel plate that can be adjusted through 90 deg. Thus the headstock spindle can be set parallel to the grinding wheel spindle or at right angles to it, and any angle in between can be ground on the periphery of the workpiece. Radially trued or formed grinding wheels allow the grinding of peripheral shapes.

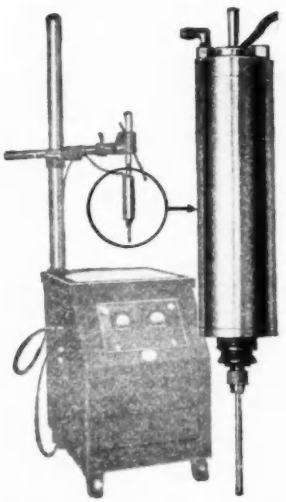
The grinding wheel on the No. 1 machine is driven by a 3 hp motor and on No. 2 machine by a 7½ hp motor. Headstock spindles on both machines are powered by ¾ hp motors. The hydraulic pumps are powered by 1 hp motors.

Both grinding wheel and headstock spindles are mounted in Cincinnati Filmatic bearings consisting of multiple segments around the journal dia. Segments are pivoted so that each one is self-adjusting under any grinding conditions. Spindle rotation develops a high pressure, wedge shaped oil layer between each segment and the journal to maintain absolutely dead center rotation.

E-2—New Metal Disintegrator

For tool and die shops, metal fabricating plants, and for work with Carboloy dies, the 1950 Thomas Metal Master now in production at the Clinton Machine Co., Clinton, Mich., removes ⅜-in. broken taps ⅝ in. long in 60 seconds, cuts a 0.155 hole through ¼-in. Carboloy in 5 minutes, ⅜-in. Steelite in 40 seconds and ¾-in. high speed steel in 60 seconds, according to the company.

The Metal Master also cuts holes in hardened dies or keyways, or oil holes in hardened gears without annealing the metal, removes jammed or broken screws from fixtures or broken gage



1950 Thomas Metal Master, a metal disintegrator offered by Clinton Machine Co.

pins from dies, and cuts round, rectangular, square or hexagonal holes of all sizes and in the hardest alloys, as well as removes screws and taps from plastics without damage. Other uses include cold welding of cast iron without cracking; arc welding; arc brazing and soldering; drill pulling; air extraction of broken metal pieces; etching on metal for identification purposes; and demagnetizing small parts.

A collet on the new model does away with the screw-type electrode and its inherent inaccuracies, enabling standardization on a 9-in. Thomlium electrode movable out from the collet as the cutting depth increases. The process increases rigidity of small-size electrodes particularly, and, with elimination of threaded ends permits an accuracy of from 0.003 in. to 0.005 in.

High cutting current of 50 to 200 amp as supplied to the electrodes is not present in the solenoid coil, which is fed by low-voltage current, assuring a cool solenoid coil at all times. Factory-set optimum speed of the 1950 Metal Master head, electronically controlled, requires no regulation by the operator.

E-3—Cylindrical Grinding Machine

The Landis Tool Co., Waynesboro, Pa., announces a new design, general purpose precision cylindrical grinding machine, designated the Grindwell, developed for small lot manufacturing purposes in large or small shops, tool rooms and for training purposes. Capacity is 28 in. between centers and it will swing 12 in. dia work.

The grinding wheel base is equipped with a 12 in. dia grinding wheel powered by a 1 hp motor. Landis microsphere bearings are used to support the wheel spindle. These bearings are self-aligning, babbitt lined, one piece steel bearings which will absorb thrust load. Close running clearance of microsphere bearings results in quick accurate response to wheel feed and a short positive spark-out period. A graduated swivel base permits swiveling the wheel head for unusual grinding

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

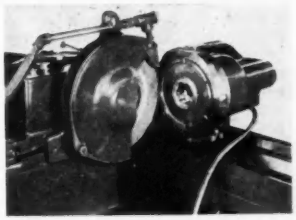
set-ups or for truing an angle on the wheel face.

The headstock has an infinite speed range from 85 rpm to 483 rpm by rheostat control. There are only two revolving parts—the motor spindle and the face plate—which results in a low compact mechanism, helpful when watching face grinding operations. Either live or dead spindle operations may be had by moving a lever. Vee belt drive is used. The base is mounted on a graduated swivel for setting up angle or face grinding operations.

Power traverse is supplied. Four different speeds may be selected from a shift lever on the front of the machine. Two-speed hand traverse is standard—the slow speed for grinding fillets or shoulders, and the fast speed for set-up. For taper grinding the table may be swiveled. A scale is graduated both in degrees and in in. per ft for settings.

Beds are normalized castings. A reservoir for coolant with settling baffles and a sloping clean out lip are part of this casting. Other compartments in the bed house the electrical control panel and traverse drive motor.

Both the wheel feed and hand traverse mechanisms are mounted on preloaded ball bearings. A full nut with compensation for backlash is used on the wheelbase. Both coarse and fine



Precision operation in face grinding. Headstock is swiveled 90 deg and work piece is attached to face plate, on the Grindwell

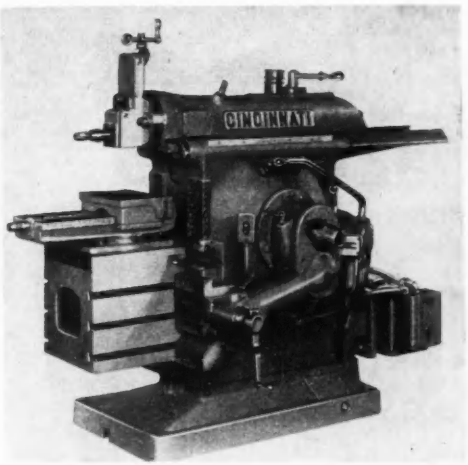
wheel feed are provided. Guides and surfaces of the swivel table, carriage and wheelbase are precision ground. Bed guides are hand scraped.

E-4—Redesigned Utility Shaper

Again in production, the Utility shaper of the Cincinnati Shaper Co., Cincinnati, Ohio, embodies many refinements found in the larger Cincinnati models. Table of the machine is supported directly on the cross rail without an apron and is heavy enough to take the full load without table support. This construction adds to the rigidity of the table by reducing overhang.

The new Utility models are equipped with higher speeds, making use of carbide tools practical. Cutting speeds over 250 ft per min are said to be possible on a 10 in. stroke. Other new improved features include automatic lubrication to all bearings including the table bearing on the rail, single

Landis general purpose precision cylindrical grinding machine, the Grindwell



Utility shaper again being produced by the Cincinnati Shaper Co.

NEW Production and Plant EQUIPMENT

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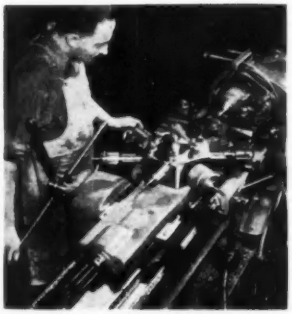
point taper gib adjustment, and improved rail lock that operates from the operator's position. New extra features available include an improved tool lifter, power down feed to the head, and power rapid traverse to the rail.

The Utility models are made in 16 in. and 20 in. stroke sizes and can be equipped with a three or five hp motor drive.

E-5—Precision Turret Lathe

The South Bend Lathe Works, South Bend, Ind., have resumed production of their No. 2-H precision turret lathe



Close-up of precision turret lathe No. 2-H, again in production by South Bend Lathe Works

discontinued during the war, and have added among refinements, a turret locking mechanism which indexes the turret head within plus or minus 0.0005 in. measured 4 in. from turret face.

The lathe can be equipped with universal chuck or independent chuck for machining castings, forgings, etc., or it can be equipped with handlever draw-in collet attachment for machining bar stock or tubing. Maximum swing over the bed is 16¼ in.; over the cross slide, 6⅞ in. Maximum collet capacity is 1 in. round, and hole through the spindle is 1⅜ in. Hexagon turret has 1½ in. dia holes for turret tools. Clearance from center of tool hole to top of turret slide is 2½ in. Effective feed of the turret slide is 6⅛ in.

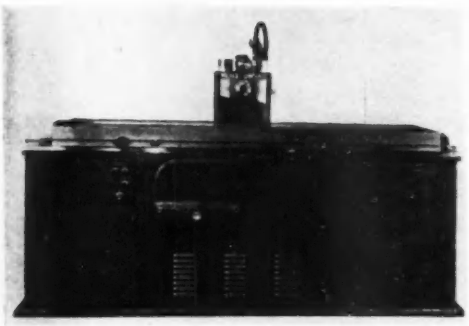
The universal carriage has friction clutch drive for 48 power cross-feeds ranging from 0.0006 in. to 0.0312 in., and 48 power longitudinal feeds ranging from 0.0015 in. to 0.0841 in.; also lead screw and split nut for cutting 48 pitches of screw threads ranging from 4 to 224 per in. All changes for threads and feeds are made through the quick change gear box at the headstock end of the lathe. Front and back tool blocks on the screw feed cross slide take cutter bits ⅝ in. sq. A 4-way turret tool block is available to order. A large dia micrometer graduated collar on the cross slide handwheel permits adjusting cutting tools with extreme accuracy.

The ram-type hexagon turret has both power feed and hand feed, with an adjustable feed trip and stop for each of the six turret faces. The turret head indexes automatically on the return stroke of the turret slide. The quick change gear box provides 48 changes for power turret feeds ranging from 0.0001 in. to 0.0148 in. Change gears in the turret apron provide an additional change for turret power feed, independent of the universal carriage feeds in both rate and direction.

Full advantage may be taken of the higher cutting speeds of tungsten-carbide tools as the result of the wide range of speeds and feeds available. The 12 spindle speeds range from 16 to 880 rpm. Use of a two-speed motor permits quick change from high speeds to low speeds for reaming and tapping operations. The motor and driving mechanism are enclosed in the base, underneath the lathe headstock.

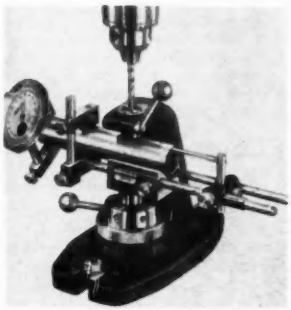
E-6—Bar Feed Automatic Machine

Automatic bar feed machine for cut-off or multi-milling operations, designed and built by Kent-Owens Machine Co., Toledo, Ohio. After the bar is placed in the fixture, the head, which carries the cutter, travels in a down direction until the cutter approaches the parts to be milled or cut off. At this point the head automatically goes into feed, feeds until the part is cut off or milled, then reverses and returns in rapid traverse. During the reverse stroke the finished parts are automatically ejected and the bar is moved into place so that the next part can be milled. The operation is continuous until the bar is used up.



E-7—Universal Drilling Tool

A universal drilling tool called the "Reglus," manufactured in Switzerland by Ad. Sulger, M.E., and exclusively



"Reglus" universal drilling tool of the Precision Machine Specialty Co.

sold in the U.S.A. through Precision Machine Specialty Co., Phila., Pa., simplifies exact drilling of round, flat, square or hexagonal workpieces within an accuracy of 0.0003 in. With accessories, it drills holes at predetermined intervals, adjacent holes for making slots, holes at any radial angle, and holes in balls. Automatically centering, the unit eliminates tracing-out and center punching.

Although primarily a drilling tool, its versatility offers many tools in one. It is an angle comparator in two planes. It serves as a depth gage and a center distance comparator on round, square, or hexagonal stock. It can drill angle holes in round balls. It is a miniature jig borer.

This "Reglus" tool, holding workpieces up to 1¾ in. dia, accommodates a series of cylindrical drill bushings having drill holes ranging up to and including ½ in. dia. Bushings, inserted from the top, are clamped by an upper ball-grip lever. Required distance between holes is set direct on one of two verniers on the standard vee-piece or on the adjustable stop, depending upon distance of the holes from the top, collar, etc., or from the end, of the workpiece. Work is fixed upward in the instrument by rotating the knurled barrel nut at the base of the instru-

(*Turn to page 54, please*)

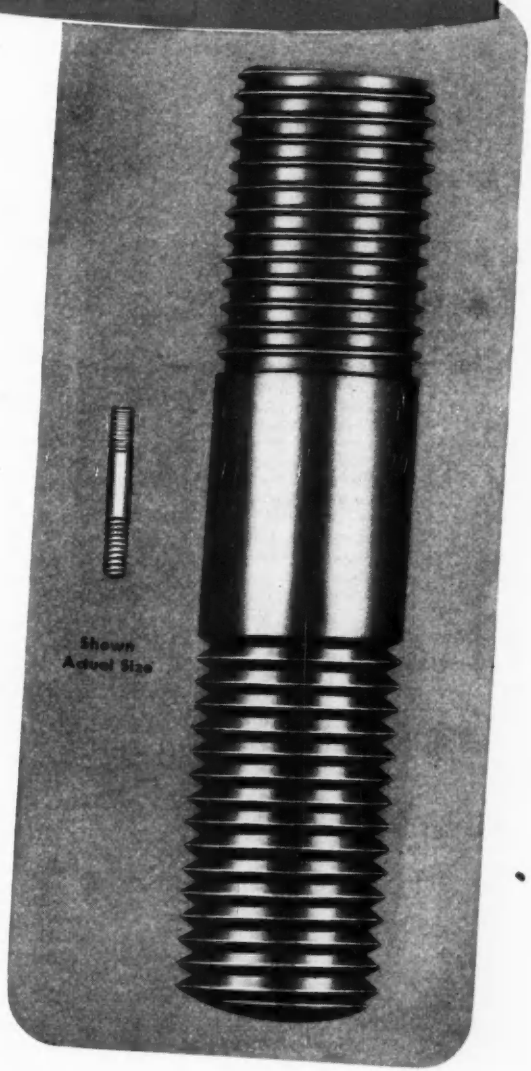
They're both LOK-THRED

NOW . . . get Lok-Thred's greater strength . . more positive locking action . . in *any* size stud, bolt or screw

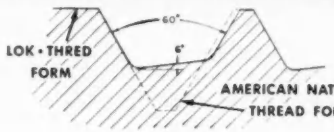
Are you making full use of LOK-THRED'S proved advantages—and its availability in any size or type of threaded fastener?

The revolutionary LOK-THRED design locks securely and becomes tighter in service . . . has much higher fatigue limits and is stronger in both tension and torsion than ordinary American National Threads...does not require selective fits.

These and other LOK-THRED features may offer important application advantages in your products. For full information, write for LOK-THRED booklet, today.



SEE THE DIFFERENCE!



Note Lok-Thred's larger cross section . . . and flat root surface instead of a relatively sharp "V" . . . as compared to the American National Thread form. Here's the secret of Lok-Thred's greater strength.

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THE NATIONAL SCREW & MFG. CO.
Cleveland 4, Ohio

Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 So. Garfield Ave., Los Angeles 22, Cal.

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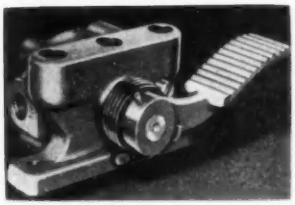
F-1—Oil-Water-Air Foot Valves

Nopak foot valves, Model "F" and Model "R," products of Galland-Henning Mfg. Co., Milwaukee, Wis., have been redesigned to provide several installation and operating advantages.



Galland-Henning Nopak foot valve, furnished in Models "F" and "R"

Elimination of the internal exhaust core in the valve disc results in larger, effective exhaust area, increase in the valve capacity, and reduction in the possibility of plugged passages. Both the "cylinder" and "exhaust" ports are now located on the flat top surface of the valve to simplify installation. The lower overall height of the valves and elimination of the side exhaust ports makes the valves more compact and streamlined.

Either "R" or "F" Nopak foot valves can be used as two-way shut-off valves or as three-or-four-way operating valves. Both valves, designed primarily for air service, may be adapted to oil or water hydraulic service, for pressure up to 100 psi.

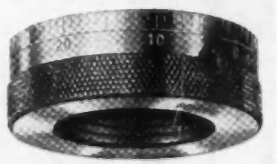
F-2—Spider-Type Gaging Spindle

A spider-type gaging spindle that completely eliminates the difficulties of cocking and sticking often encountered in checking shallow large diameter holes which offer a minimum of bearing when the spindle is presented, has been developed by the Sheffield Corp., Dayton, Ohio. It is used with the Precisionaire, a flow type air gage for checking internal diameters, bell mouth, out-of-round and the average diameters.

The spindle enters shallow holes with great ease regardless of the manner in which it is presented to the part. It is many times lighter in weight than the conventional spindle, and can be handled continuously without undue fatigue. A very flexible hose connection to the instrument makes it easy to handle and use. The spindle makes possible a reading with accuracy entirely unaffected by relatively rough surface finish. It is balanced for complete rotational accuracy, and diameter locating surfaces are faced with tungsten carbide.

Sheffield spider-type gaging spindle on Precisionaire flow-type air gage, in use checking a shallow ring gear

F-3—Micrometer Adjusting Nut



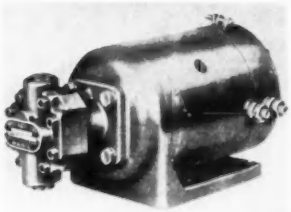
Gairing Ful-Grip Micro-Nut

A micrometer adjusting nut, called the Ful-Grip Micro-Nut, has been brought out by the Gairing Tool Co., Detroit, Mich., recommended for individual tool adjustment on multiple spindle setups. It may be used on threaded adapters and holder assemblies with or without key-ways. Accurate adjustment is guided by 0.001 in. graduations.

The set screw does not bear against the adapter threads. It gives a full grip on the threads all around by moving top and bottom parts of the nut in opposite directions, thus providing firm and parallel contact against the end of the machine spindle.

The nuts are made in standard sizes from ¾ in. to 1⅞ in. with National Acme thread. V-thread is made to order only.

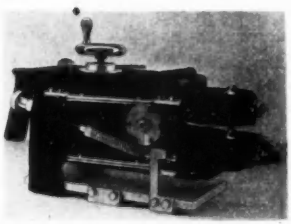
F-4—Matched Pump And Motor Unit



A pump and motor unit exactly matched to each other to assure maximum efficiency of both pump and motor, is addition to the line of Barnes Constant-Flo rotary gear pumps announced by the John S Barnes Corp., Rockford, Ill. The unit combines the specific model of Barnes Constant-Flo rotary gear pump best suited to a customer's requirements with a special 12-volt series wound motor. The unit finds use in automotive and battery powered industrial equipment.

F-5—Continuous Limit Gage

To protect metal stamping dies from being injured by material that is too thick, Pratt & Whitney, Division of Niles-Bement-Pond Co. of West Hartford, Conn., announces the new continuous limit gage which indicates or controls by a signal light, control relay, or the like, when the strip or sheet material is too heavy. This gage does not show the thickness of the material or the amount of variation but rather indicates when the material is light or heavy—not both.



Pratt & Whitney continuous limit gage

When this gage is used with a die stamping press or similar machine, it sends out a signal or impulse that stops the operation before the heavy material reaches the die. Also, the gage provides a means of inspecting continuous strip material where it is desired to control only one limit, high or low.

The range of the P&W continuous limit gage is from 0.0 to 0.300 in. with an accuracy of 0.0005 in. The gage is set by means of precision gage blocks and by turning the hand wheel until

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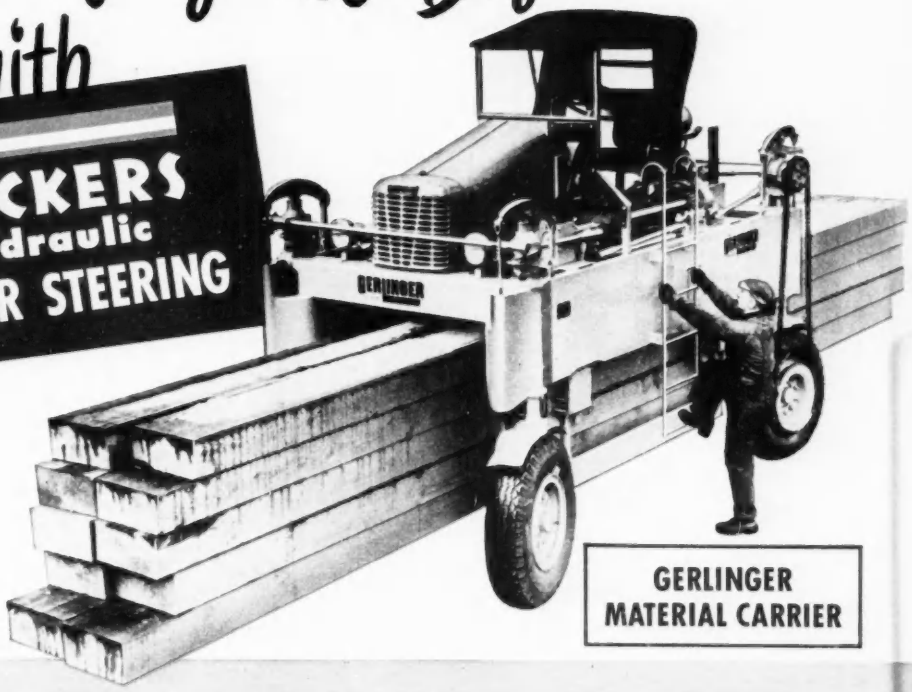
VICKERS Hydraulic POWER STEERING



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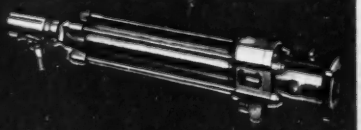

Vickers Hydraulic Steering Booster with Integral Overload Relief Valve. Bulletin 47-30a.

Vickers Balanced Vane Type Pump is Engine Driven. Bulletins 36-12 and 49-52.

Vickers Hydraulic Power Steering makes it easier and cheaper to handle logs and large piles of lumber with the Gerlinger Material Carrier. Four Wheel Steering is effortless in spite of very heavy front wheel loading. The quick, easy maneuverability speeds operation . . . substantially lowers materials handling costs.

Not only is Vickers Hydraulic Power Steering effortless and safe, it also avoids load on the conventional steering gear. Steering force reaction is absorbed by the vehicle frame . . . road shock does not reach the steering gear.

Vickers Hydraulic Power Steering is saving money for the users of carriers, trucks, road machinery and other mobile equipment . . . not only by speeding operation, but also by reducing driver fatigue. For detailed information, ask for Bulletin 47-30a.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

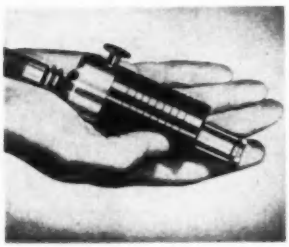
the setting light is on or just ready to come on.

F-6—Air Plier For Sheet Holders

To insert and remove sheet holders an air plier has been put into production for the sheet metal fabricating industry by Aircraft Tools, Inc., of Los Angeles, Calif.

Advantages claimed for it are faster insertion and removal of sheet holders, elimination of muscle fatigue usually caused by continued use of conventional hand operated pliers, and safety of operation.

Made of steel and Dural, treated to



Air plier manufactured by Aircraft Tools, Inc., Model AT-510A

eliminate corrosion, this AT-510A air plier is designed to reach places inaccessible to the ordinary plier. All friction parts are heat treated to withstand wear and a safety feature in the holder mount provides a firm positive grip on the holder. The versatile holder mount fits both shielded and unshielded types of holders and swivels a full 360 deg.

In operation, the sheet holder is inserted into the nose piece which automatically grips it. A finger-touch of the valve button applies the full air line pressure to the sheet holder, allowing it to be inserted into the sheet. Once in position in the hole, the button is released, locking the holder in that position. The air plier is then easily slipped from the sheet holder. The plier weighs 12½ oz.

NEW ★ PRODUCTS

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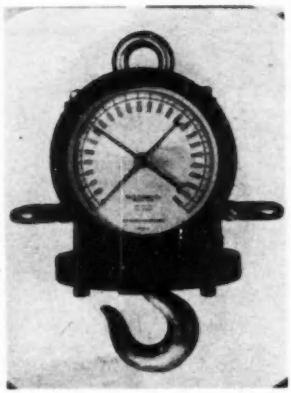


Emery hydraulic crane scale

F-7—Hydraulic Crane Scales

A standard line of hydraulic crane scales adapted also for other force and/or load-measuring applications is now produced by the A. H. Emery Co., Stamford, Conn.

Three models of the crane scale consist of Model EU-20-T, available in any one of 8 load capacities, from 0—1000 lb to 0—10,000 lb; Model EU-40-T, 0—12,000 lb, 0—15,000 lb, and 0—20,000 lb; and Model EU-60-T, 0—25,000 lb, and 0—30,000 lb.

Basic feature of the scale is the Type EU Emery hydraulic cell, the same in principle as the cell used in the Baldwin-Tate-Emery testing machines. This cell converts force into corresponding fluid pressure which is connected to a pressure indicator, calibrated to read in lbs of load on the scale.

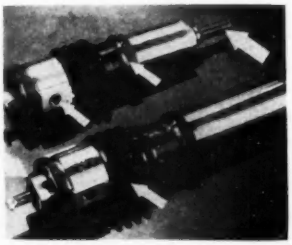
The complete Emery crane scale measures from approximately 22 in. to 36 in. in overall height, depending on the model. Hook and eyebolt are swivel mounted. Three dial sizes available are 8½ in., 12 in., and 16 in. in dia. All dials have a simple adjuster for setting the pointer to zero, eliminating need for a tare reading.

F-8—Recessing Tool Holder

Availability of a new Auto-Recess tool holder in three sizes, designed to perform automatic recessing operations on high speed automatic machines, has been made known by the Maxwell Co., Bedford, Ohio. When attached to the tool holder of the automatic machine, adjustments for recess location and diameter are made on the tool itself.

The tool employs a segmented-type gear mechanism for reducing the ratio of the cutter feed into the workpiece, taking into consideration the regular cam feed for drills and other end forming tools. This ratio can be varied when changing from one job to another requiring higher or lower feed.

Auto-Recess tools are available in the three sizes 1½, 2, and 3 — these



Maxwell Auto Recess toolholder offered in sizes 1½, 2 and 3

tool sizes indicating the size of the slide tool holder on the automatic machine that the tool shank will fit. Holders No. 1½ and No. 2 have generally the same capacity for handling a range of work from the smallest practical job up to those having an I.D. of approximately 2 in. and 3 in. respectively. The No. 3 tool has a capacity for cutting recesses up to a maximum of 4 in. I.D.

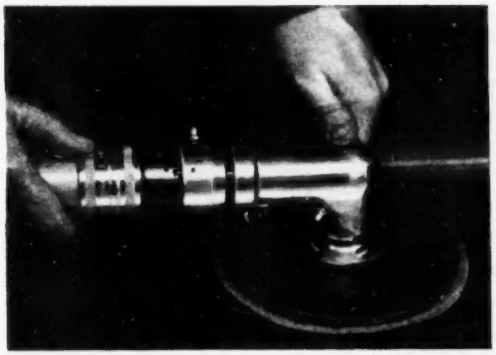
The tools can be furnished for either ball-bearing pilot operation (indicated by large arrow in left of illustration) in front of the tool itself to facilitate stopping of the tool on the face of the workpiece or any external reference point; or for draw-bar actuation (indicated by large arrow in right of illustration). The ball-bearing pilot feature provides for the exact location of the recess and absolute concentricity of cut. The smaller arrow indicates the female connection for attachment of coolant lines to the tool, bellows-type rubber chip protectors, and micrometer adjusting collar.

F-9—Automotive Fuel Pump

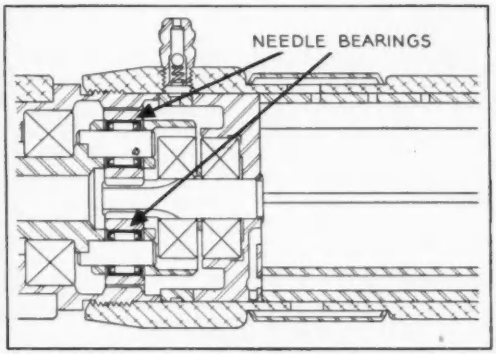
Automotive fuel pump of a mechanical type now in prduction by the Electric Auto-Lite Co., Toledo, Ohio, has been adopted as original equipment by a leading motor car manufacturer.

(*Turn to page* 54, *please*)

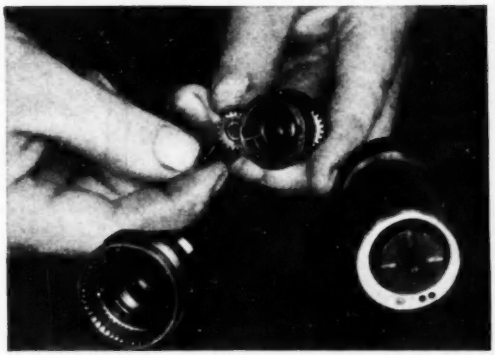
Torrington Needle Bearings Increase Power Output 10% in ARO Pneumatic Tools



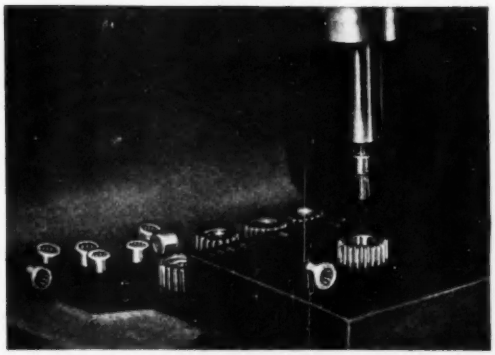
By Applying Torrington Needle Bearings in the planetary gears of the Model 7099 Screwdriver and Model 7095 Sander, Aro Equipment Corporation, Bryan, Ohio, increased power output 10%. This increase in efficiency, determined by special tests, is accompanied by reduced lubrication and maintenance, and longer service life.



No Major Design Changes were needed to adapt Needle Bearings to this application, shown above in cross-section. These compact anti-friction units met the space and weight limitations ideally, with no sacrifice of reliability. The full complement of small diameter rollers assures tremendous radial capacity.

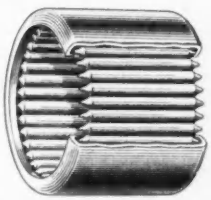


Service Life Tests were run for as much as ten times the normal life of the tools. Previously, the planetary gears, shown above, had been a trouble spot – but the Needle Bearings and the pins that serve as shafts showed no appreciable wear when tests were completed.



Installation of the Bearings is a simple arbor press operation. Lubrication is greatly simplified, since the turned-in lips of the shell of Needle Bearings retain an ample reserve of lubricant. With wear reduced to a minimum, savings in maintenance may run as high as 20 to 1, according to the manufacturer's experience.

This case shows how the performance, lubrication and service life of *your* equipment can be improved by a simple change to Torrington Needle Bearings. Let our engineers help you adapt them to your needs. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities of United States and Canada.



TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers

NEW PRODUCTION AND PLANT EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page* 48)

ment. For repetition work a ball-grip lever may be fitted to this setting nut.

Accessories include a vee mount for holding pieces from 3/32 in. to 11/32 in. dia; a cone mount for drilling balls up to 1⅝ in. dia; and a modified mount for drilling flat and eccentric pieces.

The accessory which affords drilling of holes at any radial angle consists of a clamp attached to a dial having a gravity pointer. This unit clamps directly to the workpiece and is made so that it easily revolves around the workpiece to set the pointer at zero position to start. Further turning of the workpiece shows the required angle by a direct reading on this dial.

Use of the "Reglus" by engineers, machinists and others practically eliminates all tedious layout work ordinarily involved in designing specialized drill jigs and fixtures for accomplishing varied jobs. The tool is ideally adapted also for use in research projects, and for engineering school laboratories.

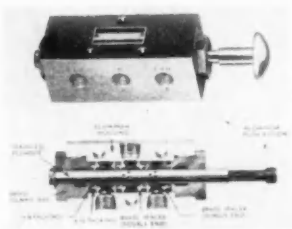
NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page* 52)

F-10—Single Plunger Control Valve

C. B. Hunt & Son, Inc., Salem, Ohio, is adding to their Quick-As-Wink air and hydraulic control valve line an entire new line of small single plunger



Hunt Quick-As-Wink small single plunger control valves, series "O" and "OE"

valves known as Series "O" and "OE" valves, suited for use with manually controlled presses, pilot circuits, and in other processing cycles where frequent manual operation is required.

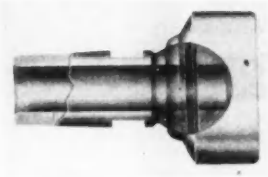
As illustrated in the sectional view, the valve consists of an aluminum housing; a hollow stainless steel plunger with precision placed ports; carefully dimensioned brass spacers accurately positioned end to end on each other (not through packing); "O" ring packers; and closing brass gland nuts and an aluminum push button. The valves are balanced and will remain in position until changed. A spring can be mounted between the push button and gland nut when spring return action is desired.

The flow is through the plunger and around the seals—not through them—thus prolonging the life of the packing and valve parts. Valves can be completely disassembled for repacking, and reasssembled in a few minutes without disturbing the connecting piping.

Series "O" and "OE" valves are furnished tapped for either ⅛ in. or ¼ in. pipe connection, and are available in 2-way; 3-way open exhaust; 3-way piped exhaust; double 2-way; 4-way; and 5-way designs; and with either push-pull or push and spring return actions.

These valves are suited for use with air, oil or water, at pressures up to 125 psi maximum (also Vacuum), at normal temperatures not exceeding 150 F. Class "O" valves have piped exhaust. The "OE" valves have an open exhaust, and should be used with air only.

F-11—Swivel Type Electrode

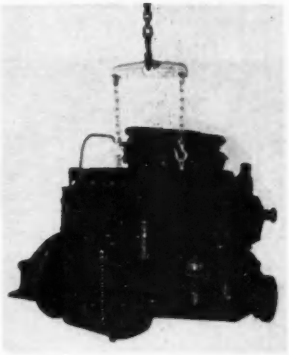


In the new design swivel type resistance welding electrodes now in production by P. R. Mallory & Co., Inc., Indianapolis, Ind., the water hole is drilled completely through the shank, bringing cooling water directly in contact with the swivel head. Tests indicate stabilized operating temperature of 94C for the new unit, compared with 332C for the earlier design, which reduction materially increases life of the swivel tip.

F-12—Lift Kit For Grappling

A new lift kit engineered to expedite all grappling operations with utmost safety has been developed by Clayborne Mfg. Co., Chicago, Ill., for automotive, aircraft, marine and industrial applications.

Weight distribution and balance combined with positive attachment through eye-bolts and eye-nuts direct to the unit being lifted, are principles



Clayborne lift for grappling operations

of the lift. Eye-bolts and eye-nuts are stamped to show safe load limits. Parts are specially hardened and cadmium plated.

Lift kit No. 1, capacity 1 ton, is universal for passenger car and light truck engines, heads, and transmissions. Special kits for individual manufacturers lines are available.

The item is furnished also in two larger sizes, kit No. 2, capacity 2 tons; and kit No. 5, capacity 5 tons, for heavy truck and tractor application and industrial purposes.

CALENDAR

Conventions and Meetings

Amer. Soc. for Testing Materials Annual Mtg., Atlantic City.June 27-July 1
Amer. Electroplater's Soc. Annual Convention, Milwaukee.....June 27-30
SAE West Coast Mtg., Portland..Aug. 15-17
Conf. on Road & Motor Transportation, Geneva .....Aug. 23
Canadian Nat'l Aircraft Exhibition, Toronto .....Aug. 26-Sept. 10
Nat'l Air Races, Cleveland .....Sept. 3-4-5
Instrument Soc. of America Convention, St. Louis .....**Sept. 12-16**
Inst. of Traffic Engineers, Washington, D. C. .....Sept. 25-28
British Passenger Car Show, London, Sept. 28-Oct. 8
Society of Industrial Packaging and Materials Handling Engineers Annual Exposition, Detroit....Oct. 4-7
Paris Auto Show, Paris.....Oct. 6-16
Amer. Society for Metals Nat'l Metal Congress & Exhibition, Cleveland, Ohio .....Oct. 17-21
American Welding Soc., Annual Mtg., Cleveland .....Oct. 17-21
Amer. Inst. Mining & Metallurgical Engineers—Metals Br., Cleveland, Oct. 17-21
Nat'l Safety Council Safety Congress & Exhibit, Chicago .....Oct. 24-28
Amer. Society Body Engineers Annual Tech. Convention, Detroit, Nov. 2-4
Chicago Auto Show, Chicago.....Nov. 4-12

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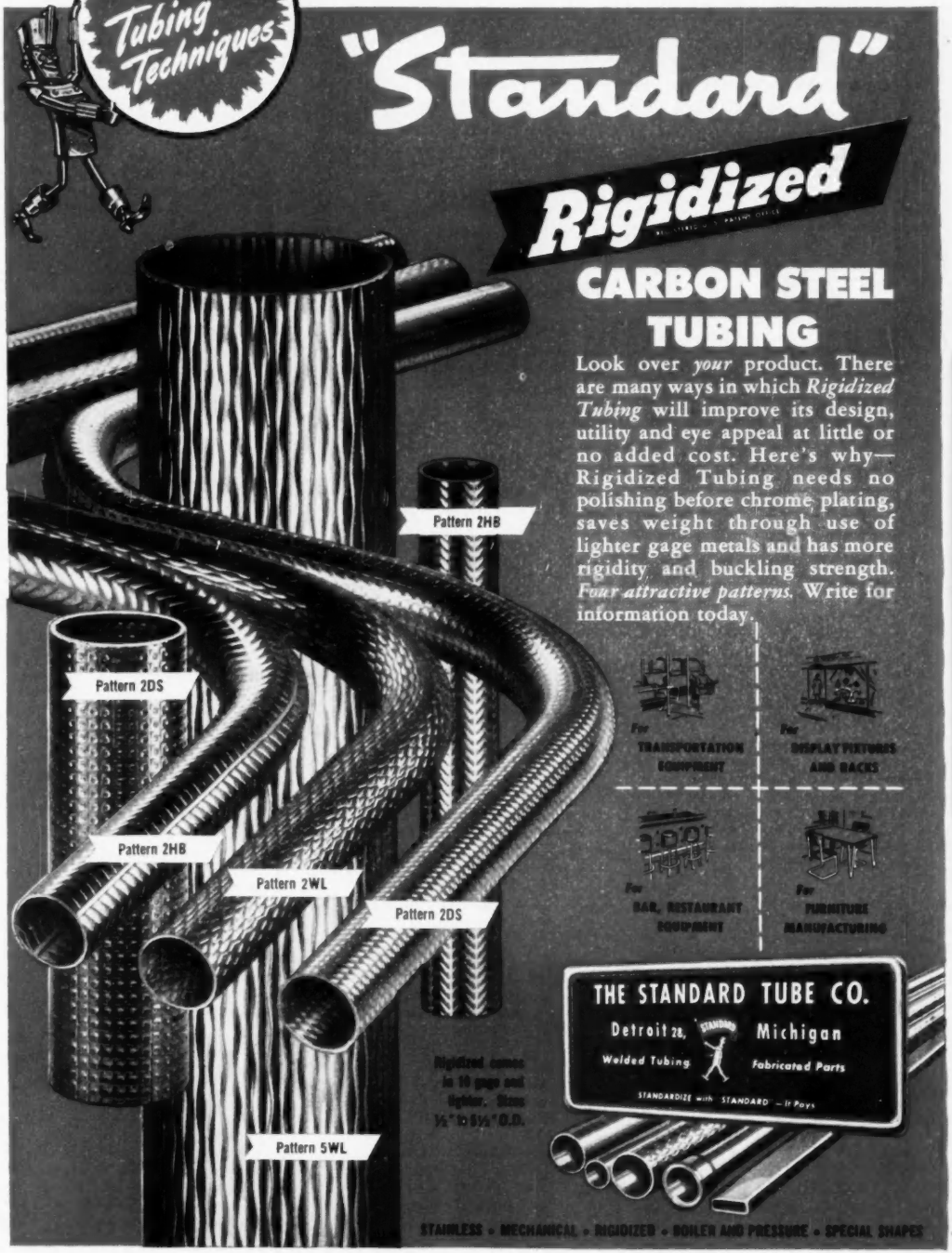
Pattern 2HB
Pattern 2DS
Pattern 2HB
Pattern 2WL
Pattern 2DS
Pattern 5WL
Rigidized comes in 10 gage and lighter. Sizes ½" to 5½" O.D.
For TRANSPORTATION EQUIPMENT
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For BAR, RESTAURANT EQUIPMENT
For FURNITURE MANUFACTURING
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PERSONALS

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

E. I. du Pont de Nemours and Co., Inc.—**Ambrose W. Staudt** has been appointed manager of the Market Research Section of the Trade Analysis Div. **George H. Braniff** will succeed Mr. Staudt as manager of the Nylon Technical Service Section.

E. I. du Pont de Nemours and Co., Inc.—The following changes in the sales organization of the Rayon Div. have been announced: **V. Ward Smith** has been assigned to concentrate on "Cordura" high-tenacity rayon sales and all indirect sales activities in the division; **Ford B. Draper** has been named an assistant director of sales to take charge of textile rayon and staple; **W. Samuel Carpenter, III,** has been appointed to assistant manager of "Cordura" high-tenacity rayon sales; **Dr. W. W. Owen** is a special representative for "Cordura" sales. **V. S. VanScoy** has been made manager of the new sales development section, with **M. A. Kennedy**, of technical service, being transferred to the new section.

Consolidated Vultee Aircraft Corp.—**J. O. Cornette** has been appointed treasurer and controller.

Plymouth Motor Corp.—The appointment of **R. W. Steere, Jr.,** as assistant chief engineer, has been announced.

Kaiser-Frazer Corp.—The appointment of **Burton Durkee**, as director of advertising has been announced, and **Robert A. Graney** has been made assistant to the president, in charge of industrial relations. **J. O. Murray**, formerly director of industrial relations, has been transferred to the West Coast on special assignment.

Ford Motor Company—The appointment of **Byron R. Lenhardt**, as accessories sales manager, Ford Division, has been announced. **Robert M. Campbell** has been appointed associate counsel and secretary, Ford International, Inc., and **W. Spencer Thompson** has been appointed planning and coordination manager. **Ray P. Powers'** appointment as manager of quality control for the Lincoln-Mercury Division has also been announced.

A. Schrader's Son Div., Scovill Mfg. Co.—**George H. Schneider** has been named manager of technical service.

Air Reduction Sales Co.—The appointment of **Richard N. Chapin** as general purchasing agent, has been announced. He succeeds **Walter R. Clark**, who has resigned.

General Electric Co.—**Harold E. Strang** has been made manager of the G-E Apparatus Dept.'s Meter and Instrument Div.

Firestone Tire and Rubber Co.—The appointment of **John L. Cohill** as assistant to the president of the company, has been announced.

Mack Trucks, Inc.—The following announcement has been made: **L. G. Bissell** and **C. T. Ruhf** have relinquished their respective positions as chairman of the board and president. The board of directors has elected to both offices **E. D. Bransome**, who is a director of Mack Trucks and at present president of Vanadium Corporation of America. An announcement was also made to the effect that Mr. Bransome will continue his association with Vanadium as chairman of the board and member of the executive committee and that Mr. Bissell and Mr. Ruhf will continue as members of the Mack board; Mr. Ruhf will remain with Mack in a consulting capacity.

Willys-Overland Motors, Inc.—**Robert Montgomery**, formerly comptroller of the company, has been appointed assistant to the first vice-president.

Federated Metals Div., American Smelting and Refining Co.—Appointment of **George M. Baumann** as puchasing agent and assistant to the plant manager, has been announced.

Necrology

William A. Falls, 57, president, Falls Spring and Wire Co., and the Great Lakes Spring Corp., died recently in Detroit.

Robert P. Page, Jr., 70, chairman of the board and former president Autocar Co., died on June 18, in Bryn Mawr, Pa.

William Robert Timken, 83, cofounder of the Timken Roller Bearing Co., Canton, O., died on June 11, in Croton-on-Hudson, N. Y.

American Steel & Wire Co.—**Harry H. Lumley** has been appointed assistant to the vice-president of operations. **John R. Gaut** will succeed him as Chicago district manager.

Allis-Chalmers Co.—**Robert S. Fleshiem** has been promoted as assistant to **W. C. Johnson**, executive vice-president of the company's general machinery division. **Roy M. Casper** became manager of the company's electrical department, succeeding Mr. Fleshiem.

Monmouth Products Co.—**Raymond Z. Oswald** has been elected president of the company, succeeding the late **Ernest L. Davis.**

The B. F. Goodrich Co.—**Robert L. Baker** has been named manager of the sales planning of the Replacement Tire Sales Div.

Francis W. Davis, Consulting Engineer—**Edmund B. Neil**, Consulting Engineer, has been named Midwest associate of Mr. Davis.

Koppers Company, Inc.—**J. L. Tunstead** has been named sales manager for the metal products division.

Sun Electric Corp.—**Joseph A. Doyle** has been appointed director of the new Government and Fleet Division of the company.

Peninsular Grinding Wheel Co.—The appointment of **R. G. Caulley** as general sales manager has been announced. **Dr. W. R. Morgan** has been made director of production and engineering of the new vitrified division.

Lear, Incorporated—**Burnham Adams**, manager of the California Division of the company, was elected vice-president of the corporation.

Willard Storage Battery Co.—**Harley A. Gardner** has been appointed treasurer of the company, replacing **I. K. Schnaitter**, who has resigned because of ill health. **C. H. Bell** has been named assistant secretary and **J. C. Crum**, assistant treasurer, succeeding Mr. Gardner.

United States Rubber Co.—Appointment of **F. M. Urban** as sales manager of engineered rubber products and **H. Leon Moran** as factory manager, Fort Wayne plant, has been announced.

Aviation Maintenance Corp.—**George E. Lam**, general works manager, was elected vice-president in charge of production. **John G. McKean** has been elected treasurer, replacing **D. H. Hill**, who has resigned.

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PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-1—Press Rebuilding

Verson Allsteel Press Co.—A new 12-page bulletin gives detailed descriptions of the company's facilities for rebuilding presses and shows typical assemblies of presses rebuilt by the company. The range of types of rebuilt presses illustrated may suggest many possibilities to the manufacturers who are interested in modernization of their facilities.

D-2—Electric Welded Tubing

Formed Tubes, Inc.—A new brochure entitled "Better Products" discusses electric welded tubing for automotive applications. It shows a variety of symmetrical geometric shapes such as rectangles, ovals and other forms. An interesting fact is the possibility of producing tubing assemblies to meet any design problems, including welded assemblies of intricate formation; and tubing having flanged, upset, swages, flattened and other configurations. Special parts for engines, aircraft, truck and passenger car chassis details, as well as pressure applications, also are illustrated and described.

D-3—Fiberglas Products

Owens-Corning Fiberglas Corp. — A new 12-page illustrated manual describes Fiberglas products available for the reinforcement of plastics. The manual includes information concerning the resins with which each is commonly used, the types of molded products to which each is best adapted, and the molding processes commonly employed.

D-4—Inert-Arc Electrode Holders

General Electric Co.—Electrode holders for inert-arc welding are described and illustrated in a new 4-page folder. Application data is included, in addition to the descriptions.

D-5—Materials Handling Pallets

National Pallet Corp. — A new catalog, titled National Pallets, illustrates and describes many types of wooden pallets made by the company. A map is included showing the location of the company's mills in the country and a list of cities where sales representatives are located.

D-6—Multi-Switch Capacitrol

Wheelco Instruments Co.—A descriptive bulletin on the new Multi-Switch Capacitrol, indicating pyrometer controller, is available. It contains such information as suggested applications, measuring and indicating features, control functions, method of applying Wheelco Electronic Principle, scale ranges and technical data. Complete specifications and prices are furnished for both Direct Deflection and Resistance Thermometer models of the new instrument.

D-7—Expansion Joints

Chicago Metal Hose Corp.—A Design Guide to Expansion Joint Selection and Application is the title of a new 28-page bulletin, written in non-technical language and containing numerous illustrations, charts and tables. It was prepared for the purpose of simplifying the selection and application of Expansion Joints in piping systems. Use of the data contained should aid in the proper selection of the size and type expansion joint necessary to fulfill the varying requirements of temperature, pressure and other factors surrounding individual applications.

D-8—Insert Tools

Carboloy Co., Inc., A 4-page supplement to its general tool catalog, GT-200, covering the expanded line of the company's mechanically held solid carbide insert tools, is available. The supplement lists specifications and

(*Turn to page 73, please*)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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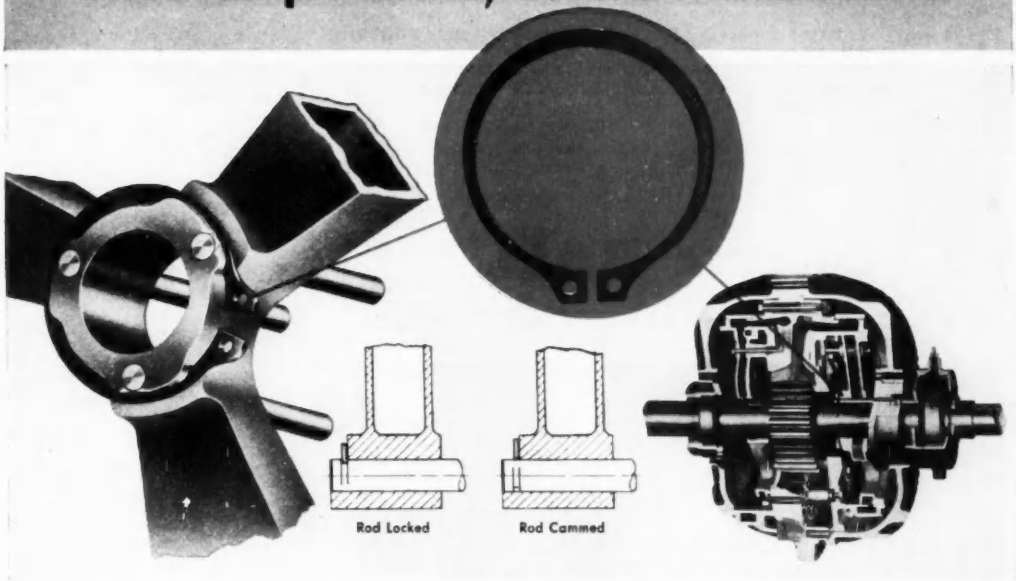
Single TRUARC ring holds 3 valve rods, saves $12 production, 10 hours maintenance



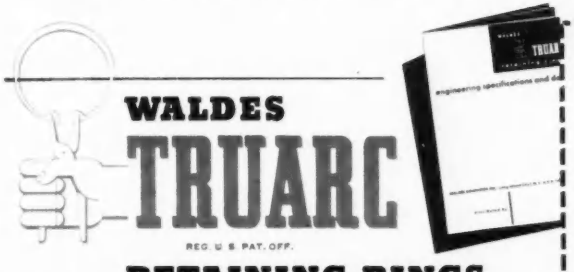
Unique feature of Thomas Varidraulic Drive design is this valve rod assembly, which permits removal and replacement of rods without disassembly of entire unit. One Truarc ring holds three rods, by engaging grooved recesses provided on one side only of each rod. When rotated 180°, rods act like cams...spread the ring...permit their easy removal. Ends of replacement rods are tapered for easy re-assembly. This design saves an average of 10 man hours of disassembly and assembly time, and eliminates the costly delay of returning the unit to the factory for repair.

Use of 8 Waldes Truarc Retaining Rings in the Varidraulic Drive results in an estimated production saving of $12.00 per unit, reports Thomas Hydraulic Speed Controls, Inc., of Wichita, Kansas.

Savings in production materials and time, plus simplification of repair procedure with Waldes Truarc Retaining Rings tell only part of the story for Thomas Hydraulic. In their own words: "Considerably less skill is required in numerous machining operations and at assembly of the drive than would have been required if the design did not use Truarc rings.

"Our use of Truarc rings has contributed substantially to a more economical design that permits sound sales pricing. Easier maintenance also provides an additional sales point."

Truarc can cut costs and improve your product, too. Wherever you use machined collars, nuts, bolts, snap rings, cotter pins—there's a Truarc ring that does a better job of holding parts together. Waldes Truarc Retaining Rings are precision-engineered, easy to assemble and dis-assemble. Only Truarc stays circular always, to give you a never-failing grip. Send us your drawings. Waldes Truarc engineers will be glad to show you how Truarc can help you.



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Business Address_____

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General News

(*Continued from page* 23)

Leeds & Northrup Celebrates 50th Anniversary

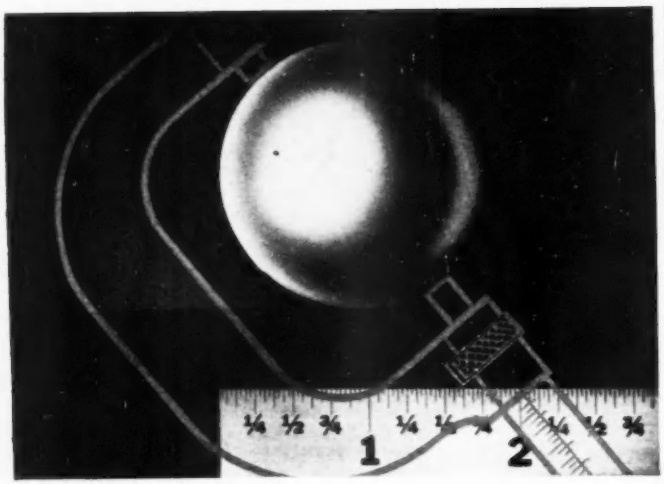
Celebrating the beginning of its 50th anniversary, the Leeds & Northrup Co., Philadelphia, recently played host to 3500 employees and their guests at a dinner, entertainment, and dance in Philadelphia. Morris Evans Leeds, founder of the company and now chairman of the board, received a gold 50-year service plaque and a bound testimonial expressing the organization's esteem for its founder.

BLS Study Shows Wage Rates of Tool and Die Makers

A recent Bureau of Labor Statistics study shows that the average earnings of tool and die makers in the machine tool accessory establishments in December 1948 ranged from $2.22 an hour in Detroit to $1.60 an hour in Hartford, among 10 leading centers of the industry.

ONLY A BALL

has...One Dimension...One Surface



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Important not only in precision ball bearings, but also in the lot of other applications where Strom metal balls have been doing the job better. Strom has been in on a great many ball-application problems, and knows how important these two factors are for the best results.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer

Plymouth Appoints Steere Asst. Chief Engineer

R. W. Steere, Jr., has been appointed assistant chief engineer of Plymouth Motor Corp. He succeeds A. W. Ross who has been transferred to an executive assignment with the central engineering division of Chrysler Corp.

Management Group Awards Fowler McCormick

Fowler McCormick, International Harvester Co., was recently awarded the 1948 Gantt Memorial Medal for "distinguished achievement in industrial management as a service to the community" by the American Management Association.

House Appointed Manager of Timken Brake Unit

Bryan E. House has been appointed general manager of the brake division of Timken-Detroit Axle Co. He has been associated with Maxwell Motor Co., Buick, Motor Wheel, Bendix Brake Co. and Cleveland Welding Co.

Bendix' Pacific Division Adds Space

The Bendix Aviation Corp.'s Pacific Div. is adding 36,000 sq ft to its North Hollywood plant for expansion of hydraulic equipment manufacture and hydraulic brake drum assembly.

Honor Former Sales Head of Gleason Works

Connected with the Gleason Works, Rochester, N. Y., for almost 40 years, Henry Leon Lampman, formerly gear sales manager, was honored recently at a dinner in Rochester.

Palmer Made Treasurer of Wilson Foundry

George L. Palmer, treasurer of Willys-Overland Motors, has been made chairman of the board of Wilson Foundry and Machine Co., Pontiac, Mich., a subsidiary of Willys. He succeeds Arthur J. Wieland, who resigned following his resignation from Willys as executive vice president.

Sikorsky Gets British Air Award

The silver medal of the British Royal Aeronautical Society was recently awarded to Igor L. Sikorsky, pioneer flying boat and helicopter designer. Mr. Sikorsky received the award at the second Anglo-American International Aeronautical Conference in New York City.

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CATALOG NO. 11

contains the complete listing of P&W Gages and Gaging Equipment. To obtain a copy of Catalog, or of any individual Bulletin(s) illustrated, simply check the corresponding numbers in this coupon...

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Catalog No. 11....

Making Rear Axles

(*Continued from page 27*)

even then it has a hardness of 269-321 Brinell. Cutting is done with a special grade of cemented tungsten carbide. Fastest cutting speed, naturally, is on the flange and this is at the rate of 514 fpm with a feed of 0.0154 in. per revolution.

The outer end of the axle shaft is splined by hobbing in Barber-Colman hobbers. Although they have continued the use of old hobbing machines, the rate of spline production has been greatly increased by the adoption of triple-lead hobs.

What is said to be the largest single piece broaching tool in use at the present time is the one made for broaching the big bevel drive gear which is machined from a forging of 8720 alloy steel. The internal gear produced by this broach as 44 teeth of 5/7 pitch with a PD of 8.8 in. The broach is about 66 in. long and approximately 9¼ in. in diameter. It is said that when the billet was ordered from the steel mill it represented the casting of the largest piece of high-speed tool steel ever made in this country.

The gear is broached in the impressive horizontal LaPointe broaching machine illustrated here. It has a capacity of 50 tons and a ram stroke of 76 in. Cutting is done at a ram speed of 10 fpm, removing 2¼ lb of metal in the process, from each work piece.

During the past several years AUTOMOTIVE INDUSTRIES has shown a number of examples of the familiar Gleason Revacycle machine for cutting bevel gears. The one illustrated here is used for cutting differential side gears and marks an interesting example of advanced practice. Its chief characteristic is the automatic loading and unloading mechanism instead of magazine feed. The machine is fitted at the apron with two fixtures containing loading spindles, one having blanks for loading into the machine, the other for stacking finished gears. In operation, the machine has loading fingers, which at the proper point in the cycle, move outward to pick a blank off the spindle, then carry it to loading position in the chuck. At the end of the operation the same fingers remove the finished gear and load it onto a spindle of the other carrier.

The major feature of this method of loading, however, is that the mechanism is so designed as to reject a gear blank which does not fit properly in the chuck. If it does not fit, the fingers automatically remove the blank and reject it.

Returning to the Vulcan transfer machine, it may be noted that the sequence of operations is given in tabular form for convenience. Examination of the photograph of this machine will show clearly the conveyor that traverses the entire machine in a closed circuit. Distinctive feature is the use of individual fixtures which travel on the conveyor line. At the end of the machine line, at the extreme right, the fixtures emerge from the machine and travel on the conveyor to return to the start of the operation. As they pass the bend in the conveyor at the right, the fixtures move through an alkali washing machine which removes chips and oil in preparation for reuse.

The Cross machine mentioned earlier is designed to handle eight different parts. A typical sequence of operations is as follows:

Station 1—Drill large hole through center boss from right hand side.
Drill ¼-in. hole through same boss from top.

Station 2—Ream large center hole with right hand head.
Mill two bosses on inside of fork with rear head.
Form-mill slot in shank with left hand head.

Station 3—Drill and ream two small holes in fork end with combination tools.
Spot-face and chamfer ends of large hole with combination tools.
(Right and left-hand heads each have one spotfacer and one combination drill for working on opposite sides of the part.)

SHOW A NEAT FIGURE IN SAVINGS ON SOLVENT CONSUMPTION

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BONDERITE corrosion resistant paint base . . . PARCO COMPOUND rust resistant . . . PARCO LUBRITE wear resistant for friction surfaces

Reo's Gold Comet Engine

(*Continued from page 36*)

illustrated, the heavy duty distributor is driven through a flexible coupling at the upper end of the shaft, its function being to absorb torsional vibrations from the camshaft line. The distributor cap incorporates a dust shield for weatherproofness. Champion J-6, 14 mm spark plugs are used, with a weatherproof cover at each one. The heavy duty coil is mounted on the side of the block right near the distributor.

The induction system comprises the intake manifold which is an integral part of the cylinder head casting; a duplex type 1¼ in. downdraft carburetor supplied by Zenith and Carter; and an oil bath air cleaner. The intake manifold has manual heat control. An important feature of the intake manifold is the provision for maintaining uniform mixture temperature by circulating the jacket water in a passage encompassing the floor and partly up the inner side of the manifold branch. The exhaust manifold is a one-piece casting.

Some of the other accessories may be mentioned at this point. The diaphragm type fuel pump is mounted at the lower edge of the block on the left away from exhaust manifold heat. Provision is made for installation of a Bendix-Westinghouse air compressor when specified. In this case it is driven by a separate V-belt drive at the front end, involving the use of an auxiliary pulley off the crankshaft end. As illustrated, the standard accessories—water pump and generator—are driven by a double V-belt. Where required, provision also is made for a tachometer drive, this being taken from the gear driving the oil pump and distributor.

Crankcase ventilation is of road draft type with a simple bent tube leading from the push-rod cover. It has a baffle inside to provide a labyrinth seal against loss of oil. On the valve gear cover there is a large sized breather of air cleaner type serving the dual role of an air inlet as well as oil filler cap.

A large oil filter of interchangeable-element type is mounted directly to the block, as shown, at the lower edge of the crankcase, with the element below the bracket. Another of the unique features built into the engine is provision for an oil cooler—without plumbing—if desired. When specified, it can be attached directly to the plate which may be seen immediately above the oil filter installation in the transverse section, although the plate actually is in the center of the block. This is the point at which the cooling system enters the block and provides an adequate mass of water for circulating about the oil cooler.

The other major accessory—standard equipment, in this case—is a King-Seeley velocity type governor for limiting top engine speed.

Reo is justly proud of the cooling system designed into the engine. The water pump is of centrifugal type, arranged to direct the coolant through a cast passage in the side of the block to the distribution area at the center of the block, mentioned earlier as the point of application of an oil cooler. From this central point coolant is distributed forward and rearward. Generous water passages are provided around the wet sleeves and also about the intake passage, mentioned previously. As illustrated, liberal provision also has been made to cool around the valve seats. This is done rather ingeniously by a series of jets near the top surface of the block and located on both sides of the valve ports. The object of this arrangement is to force jets of coolant simultaneously on both sides of exhaust valve ports, thus tending to develop rotary flow which assures thorough scrubbing of hot surfaces by the fluid. The coolant stream leaves the block through a water manifold mounted on the side, leaving the head at three points. The main thermostat for controlling coolant temperature is mounted in the water manifold. It is not of by-pass type but there is a by-pass tube

(*Turn to next page, please*)

The Aristocrat of Bearings

In golf, low score makes the champion. With bearings, low score in quietness is evidence of the championship anti-friction performance. These scores are obtained by measuring, in a scientific radio sound test, Anderons of sound of the ball bearing in operation. Recently Hoover ball bearings were sound tested in competition with four nationally know makes. Three hundred and fifty ball bearings, of the same sizes and quality, were tested. Hoover Ball Bearings with Honed Raceways scored 24 Andersons lower than the nearest competitor! Would such championship performance, at reasonable cost, add to the value of your product? A request, on your letterhead, will bring you a copy of the Hoover Engineering Manual.

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in the system to permit constant bleeding at all times.

The engine is designed for full pressure lubrication at 50 psi by means of the sump-mounted Gerotor oil pump. Cleanness of the circulated oil is assured by the Floto screen through which all oil to the pump must pass. Oil is fed through the crankshaft, in conventional fashion, to all main and rod bearings. Oil also is fed to the camshaft bearings and to the gears at the front end. Cylinder wall lubrication is by means of squirt holes drilled angularly in the upper surface of the rod big end. Lubrication to the overhead valve mechanism is supplied under pressure by means of intermittent feed through a slot in the rear camshaft journal.

Premium Gasoline Required by Large Percentage of Cars

(*Continued from page* 45)

by Socony-Vacuum Oil Co., Shell Oil Co. and the Ethyl Corp., respectively, are summarized in the accompanying table.

These figures indicate the percentage of the cars tested which were free of knock on the corresponding reference fuel blend. It is necessary to translate these data on reference fuels into performance on commercial gasolines in order to relate the antiknock quality of present-day premium gasoline to present-day engine requirements.

A simple generalization, sufficiently accurate for the present purpose, is that when fuels are rated by their antiknock performance in cars on the road, the result is somewhere between their Motor and Research octane numbers. The road rating of fuels in cars of newer design is usually closer to their Research value than their road rating in older cars.

It has been concluded by the respective authors of the foregoing surveys, based on a wide experience in the investigation of antiknock requirements, that these data indicate that 30 per cent to 45 per cent of the present car population requires a premium gasoline to be free from knock.

Of even greater interest, I believe, is the more recent work undertaken under the auspices of the Coordinating Research Council. The results of this work have not yet been published, but I have been given permission to refer to them.

On the basis of their latest survey of car requirements, these data show that to satisfy the octane requirements of 90 per cent of the cars in operation a fuel with a road rating of 88 is needed; to satisfy the requirements of 70 per cent of the cars calls for a fuel with a road rating of 84; to satisfy 50 per cent of the cars requires a fuel with a road rating of 81; and to satisfy 30 per cent of the cars a fuel with a road rating of 77.5 is required.

These requirements are in general higher than those previously reported by Ethyl and other laboratories. Moreover, they are believed to be more representative of actual values since special care was taken during the tests not to disturb deposits and other prevailing engine conditions. One of the companies participating in the survey concludes that on the basis of these figures only 30 per cent to 50 per cent of the cars on the road will be free from knock on the current regular grades of motor fuel.

All of these surveys, then, demonstrate that the number of cars which can benefit from premium gasoline is much larger than had been popularly supposed.

From a paper presented by the author at a recent meeting of the American Petroleum Institute Marketing Division in St. Louis.

Plated Cylinders a Secret of Berlin Airlift Success

The $1,500,000 cylinder chromium-plating plant at Kelly Air Force Base, Tex., has increased its production rate since last October from the plating of 250 aircraft-engine cylinders per month to 200 cylinders per day. Almost 50,600 man hours now are used per month.

This came about because of the orders from the Air Materiel Command —the objective being to keep the C-54's flying on the Berlin airlift. Over 3000 R-2000 engine cylinders for the C-54's had to be plated by the last of November. No facilities were available other than at Kelly AFB.

Whole new methods were developed and the necessary skilled personnel were acquired. Over 150 plating anodes were redesigned and fabricated, and plastic plating aids were manufactured in large quantities.

Cylinders are received from major overhaul depots, squadrons, and overseas activities throughout the Air Force. Those received from the overhaul depots generally need no primary cleaning before work is begun, while those from other sources often have to be soaked in carbon remover and sand-blasted. Then follows the process of making the cylinder ready for plating.

Plating method at Kelly AFB is the channel-type porosity process with chromic acid of a density of 250 gm/l of water used for the plating solution. Ratio of chromic acid to sulphate is 100 to 1 and current density is three amperes per square inch.

Much emphasis is placed on plating conditions and plating control. All solutions are analyzed each day for chromate, trivalent chromium, copper and iron content, and amount of sulphate. The findings and corrections keep solutions as near standard as possible. Temperature is controlled closely to obtain the pattern of porosity required by the method.

Briggs Says Car Body Cost Up 78 Per Cent Over 1941

The cost of producing automobile bodies has increased 78 per cent since 1941, according to the *Briggs Assembler*, an employe publication of the Briggs Mfg. Co. The company points out to its workers that despite record profits last year on an all-time peak in sales volume, the percentage of profits rose only one-third of one per cent over the previous year, amounting to 3.9 per cent of sales, and was well below the prewar figure of 5.9 per cent earned in 1940 on gross income, which was about 60 per cent smaller.

SAE Abstracts

(*Continued from page* 44)

weight ranges, the details of which have been very able surveyed in recent papers presented before SAE meetings. By such refinements as these we may confidently expect continued small gains in specific horsepower and by moderate increases in displacement without lengthening strokes, somewhat higher speeds and as much compression pressure as available fuels permit, higher net outputs. Ever since the war there has been a general reshuffling of engine sizes, so that down through the lines, given models have had power increases almost equal to their up-rating of capacity.

Rumors are to the effect that experiments are now in process on the West Coast with a highway transporter of 700 hp.

Swedish Saab 92

(*Continued from page* 33)

Brakes are Lockheed hydraulic type with eight-in. malleable drums, cast in one piece with the hubs. The hand brake lever is located between the two front seats and applies the rear brake shoes through steel cables. Brake lining width is 1½ in.

The Saab-92 is said to be built almost entirely from Swedish material with outside purchases constituting but 17 per cent of the car's cost. Only electrical units and brakes are purchased from outside firms. Gunnar Ljungstrom as chief designer of the Saab-92.

Federal Diesel Truck

(*Continued from page* 37)

limiting valve. Standard equipment also includes a heavy duty Diesel muffler up rear of cab and Kysor automatic shutter to assure proper engine temperature control.

Just published

A BOOK THAT WILL MAKE IT EASIER TO DESIGN BETTER TWO-STROKE CYCLE DIESELS

SCAVENGING OF TWO-STROKE CYCLE DIESEL ENGINES

By

Paul H. Schweitzer

The first practical engineering guide to the key factor in two-stroke cycle engines

This new book is the first to explain in practical engineering terms the heart of the design problems of 2-stroke cycle diesels. All details of all types of scavenging are fully described, their underlying principles, and operation in the engine as a whole. Formulas are reduced to charts to make them easier to apply to specific design problems. Mathematical calculations are also simplified wherever possible.

Up-to-date manufacturers' data

Full descriptions and diagrams of the major two-stroke cycle engines being manufactured today are given, with confidential data not generally available heretofore. Design and testing procedures are fully explained, with emphasis on practical trouble-shooting types of tests. Any engineer working on diesels today will find this a most helpful book.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity declined further during the week ended June 4. Department store sales, electric power production, railway freight loadings, crude oil output, and bituminous coal production were lower than in the preceding week, while construction increased. The *New York Times* index of activity for the week ended June 4 stands at 140.8, as compared with 143.9 in the preceding week and 146.0 a year ago.

Sales of department stores during the week ended June 4, as reported by the Federal Reserve Board, equaled 259 per cent of the 1935-39 average, as compared with 275 in the week before. Sales were eight per cent below the corresponding distribution a year ago, as against a preceding decline of seven per cent. The total in 1949 so far reported is six per cent less than the comparable sum in 1948.

Electric power production declined contraseasonally during the week ended June 4. The output was 3.6 per cent above the corresponding amount in 1948, as compared with a similar advance of 3.8 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 698,824 cars, 11.0 per cent less than the figure for the week before and 14.9 per cent below the corresponding number recorded in 1948.

Crude oil production in the week ended June 4 averaged 4,889,150 bbl daily, 7850 bbl smaller than in the preceding week and 586,650 bbl under the comparable output in 1948.

Production of bituminous coal and lignite during the same week is estimated at 10,650,000 net tons, 11 per cent less than the output in the week before and 23 per cent below the corresponding quantity in 1948.

Civil engineering construction volume reported for the week ended June 9, according to *Engineering News-Record*, was $226,161,000, or 83 per cent more than the preceding weekly figure and 30 per cent above the comparable sum in 1948. The total recorded for 23 weeks of this year was 17 per cent more than the corresponding amount in 1948. Private construction for the period was 19 per cent above that a year ago, and public construction increased by 15 per cent.

The wholesale price index of the Bureau of Labor Statistics during the week ended May 24, at 156.1 per cent of the 1926 average, showed no variation from the preceding week but was 5.5 per cent below the corresponding figure in 1948.

Member bank reserve balances increased $94 million during the week ended June 8. Underlying changes thus reflected include declines of $244 million in Treasury deposits with Federal Reserve banks, $31 million in money in circulation, and $6 million in Treasury cash, accompanied by increases of $39 million in gold stock and $37 million in non member deposits and other Federal Reserve accounts.

Total loans and investments of reporting member banks increased $55 million during the week ended June 1. A decline of $152 million in commercial, industrial and agricultural loans was recorded, marking the 26th consecutive weekly reduction. The sum of these business loans, $13,476 million shows a net decrease of $731 million in 12 months.

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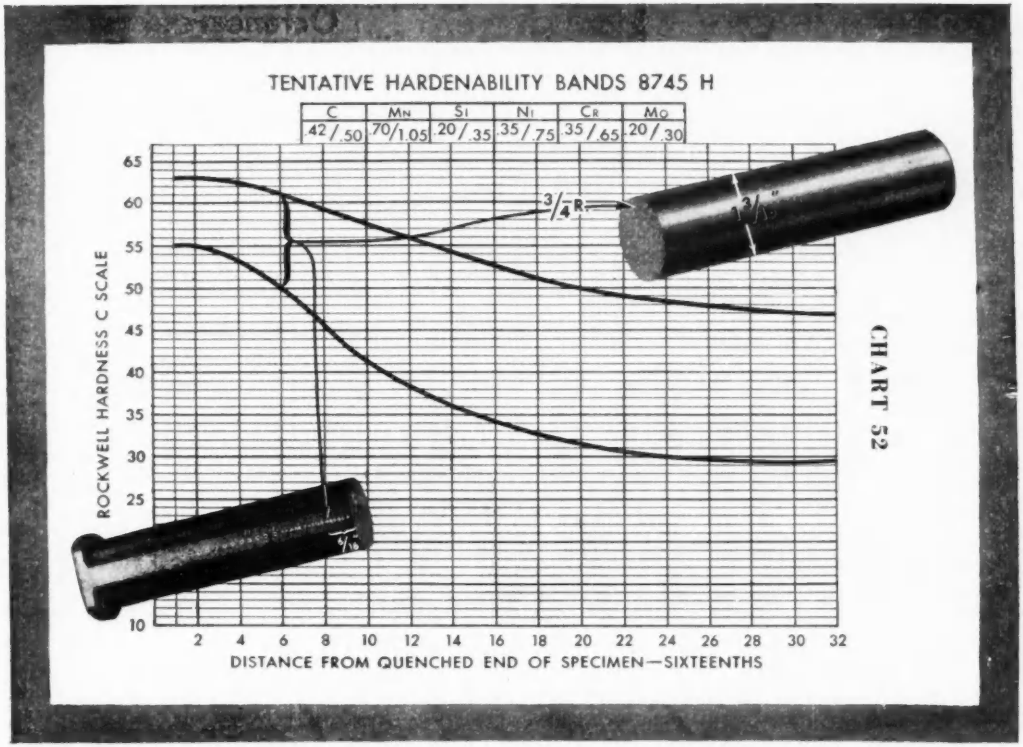

This hardenability chart for 8745 H shows that the Rockwell hardness at a point 6/16 in. from the quenched end of a Jominy specimen is the same as that found at the three-quarter radius of a 1-3/16-in. bar section quenched in agitated oil.

How You Gain by ordering to Hardenability

Bethlehem's production of alloy "H" steels has more than doubled in the last two years. Progressive buyers of steels in all industries are now specifying hardenability bands to promote uniformity. This provides worthwhile advantages, as top extremes in hardenability frequently cause quenching cracks, and bottom extremes may mean failure to obtain the effectiveness of quench desired.

For example, a 1-3/16-in. round must be quenched in oil to produce Rockwell C-50 minimum hardness at the three-quarter radius. Standard cooling rate curves for a mildly-agitated oil quench show the commensurate distance from the hardened end of the end-quench test to be 6/16 in.

When this required distance is located on an established hardenability chart, such as the one illustrated, we find that 8745 H analysis will produce 50 minimum and 61 maximum hardness. This indicates that 8745 H meets these particular requirements. The possibility of getting an 8745 type steel of lesser or greater hardenability is eliminated if the "H" steel is ordered.

Hardenability charts similar to this have been published by the AISI covering all of the popular alloy steel grades.

Whether you order to hardenability or whether you use the conventional methods, Bethlehem metallurgists will be glad to help you with your analysis, heat-treatment and machining problems. We make all of the alloy steels listed by AISI, as well as special grades.

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BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL ★

High Compression without High Octane Fuel

(*Continued from page 31*)

could not support the weight of a 6000 to 8000 hp piston engine. On the other hand, the continuous combustion engine equipped plane may not carry sufficient fuel for super-range. We must go both ways with planes designed for and equipped with power plants for super-speed, and planes designed for and equipped with power plants for super-range. In other words, we must have machines for supersonic speeds of 1000 mph or better, and machines for obtaining .24 lb of fuel per brake horsepower hour.

SAE papers on this subject during the past three years have carefully pointed to the advantages in fuel consumption available in a compounded engine, the compound being piston engine with turbine power feedback, and jet use of the residue exhaust. However, some authors have concluded their remarks with opinions that such facts are of no importance today since the continuous combustion engine obsoletes everything else.

We can all be grateful that the men today responsible for our air strength progress are keen and intelligent enough to continue supporting piston combination engines. The recent Curtiss Wright demonstration of a compound engine indicates that such power plants fill the need of super-range.

Therefore, we feel it fair to say:

(a) Piston engines will continue for some time in the service of our Air Force.

(b) Piston engines must deliver for aviation a minimum fuel consumption. (.24 lb bhph.)

(c) Piston engines must be compounded to raise the thermal efficiency to provide this low fuel consumption.

(d) The piston unit of the compounded engine must be modernized to permit the use of approximately 80 octane fuel.

(e) The piston unit of a compound engine may be required to change its outline to lower head resistance. Thickness 36 in. and overall width 60 in.

(f) The piston unit of a compound engine should consider the advantages of a positively operated valve mechanism with inherent aid to engine cooling. We must progress mechanically.

We propose here to discuss the question of piston engine development for vehicles and aircraft to indicate how we might meet the seeming demands of the future for higher power and greater fuel economy without super-octane fuel.

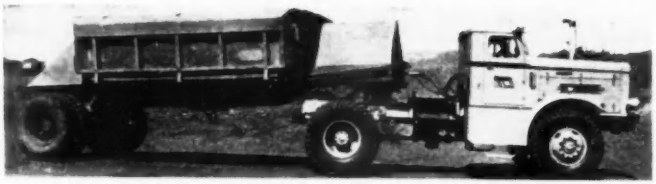
Figs. 1 to 4 show schematically four types of engines that have been under fairly constant development for many years. Later we shall analyze each of these and compare them with present day production engines.

Fig. 1 — The Argyle single sleeve. This is a very old principle and has been under development for many years, and has been in the foreground of several leading aircraft engines since 1937—the Bristol Radial Centaurus, the Napier Sabre and the Rolls Royce Eagle. These are modern engines and during World War II the Napier Sabre and the Centaurus could have been built in this country. The Napier Sabre was not only offered for building in this country, but begged for; it was not "wanted." Certain technical individuals actually believed this engine would not even run. It was probably more of a hope than a belief since many Sabre engines were in the air doing well. Thank goodness this type of individual is no longer in a decisive position; instead we have found the engineers and technical people now within the planning area of the Air Force intelligent

(*Turn to page 70, please*)

HOT & HEAVY

HAULING ORE IN THE MESABI



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- **prelubricated for life — designed with exceptionally large grease reservoir, factory-packed with the best lubricant obtainable.**
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and alert, and decisions are bound to be made on real judgment.

Fig. 1—"A" is the combustion chamber that may have a variety of shapes and can include a substantial anti-detonating quench area. The Sabre and the other single sleeve valve engines produced to date do not have a quench area, yet experience with them indicates an additional 15 octane latitude as compared to overhead poppet valve engines of equal power output.

"B" is the single sleeve that moves up and down and rotates. This gives a quick opening port area for intake and a quick closing for the exhaust. There are many combinations of porting that have been used and this data is available in the trade literature.

"C" and "D" are the ports in the cylinder block. "E" is the spark plug located in the center of the combustion chamber, which is excellent. It is buried inside the individual cylinder head "G" which is not too good, but seems to work. The single sleeve "B" and the heavy ring "F" which is for sealing purposes require development work before they are satisfactory. The Sabre used a hardened austenitic material for the sleeve and a very heavy ring for the seal. Cooling around or across the cylinder head requires that coolant enter head at "X" and leave at "Y."

Fig. 2 is the Skinner single split sleeve engine where half sleeves move in opposite direction. This engine has been under developmnt for at least twelve years and no doubt can give excellent results. It was never designed for anti-detonation since it was always capable of 2½ to 3¼ additional compression ratio as compared to present vehicle engines. However, it too is subject to additional development.

"A" is the pancake combustion chamber, "B" and "C" the intake and exhaust ports in the cylinder block. "D" are the ports in the sleeve, which sleeve is split and moved by rockers, "G." This sleeve moves between the cylinder block and a straight stationary sleeve or bore. The problem of fits, lubrication and metallurgy must be dealt with during development. The fact that this engine continues under development is symbolic of its possible virtue. Here is a vehicle engine with a possible 20 octane additional latitude as compared with present engines of the same output. The high breathing ability of this engine makes it ideal for use with transmissions that require that engines pick up speed in the shortest time.

Fig. 3 is the Aspin rotating combustion chamber engine. The development of this engine has been going on twelve years and quite a number have been built for development and some have been in use.

"A" is the rotating combustion chamber in which "B" is the actual firing chamber which lines up by rotation with "C" the exhaust port and "D" the intake port and then with "E" the spark plug which is cut off after ignition takes place, making need for special plugs unnecessary.

Mr. Aspin has always been careful to incorporate an anti-detonating area in his engine since he believes in the maximum compression ratio. Fourteen to 1 was his original recommendation and he has operated many engines at this ratio. This author has watched these engines run and has never heard them detonate. The Aspin laboratory is not a comfortable place for observation since Mr. Aspin likes to run his engine rather fast, 7000 rpm is normal to him, and he likes to demonstrate his special pet, a single cylinder that he runs up to 14,000 rpm. A man's ability to observe lowers as the speeds begin to go above 10,000 rpm.

This engine probably represents the highest allowable compression ratio for spark ignition. It probably offers at least 50 octane additional latitude as compared to present day engines. This engine has its own problems and we will deal with them later.

Figs. 4 and 5 are the Abell single valve engine. It is favored by this author and will be dealt with at length later. The combustion chamber "A" can have an infinite variation in shape in the piston or cylinder head, and Fig.

(*Turn to page 73, please*)

THE REAL REASON FOR RIBS...

Brake drums in heavy duty service are subject to *severe flexing stresses* imposed by the pressures of of the shoes, tending to stretch the drum out of shape; and high temperatures, sometimes running to over 1000°. The characteristic ribs on GUNITE Brake Drums look like cooling fins but are not. Their purpose is (1) to stiffen the drum and hold it in shape against the shoe pressures, (2) to permit the use of thinner sections and thus reduce internal compressive and tensile stresses that produce "heat check", and (3) to permit axial expansion of the braking surface at high temperatures, further tending to prevent heat check and breakage. The GUNITE rib design was developed by hundreds of gruelling over-the-road tests and its effectiveness has been demonstrated by a thousand million miles of silent proof. *Buy RIBBED Gunites for heavy duty braking!*

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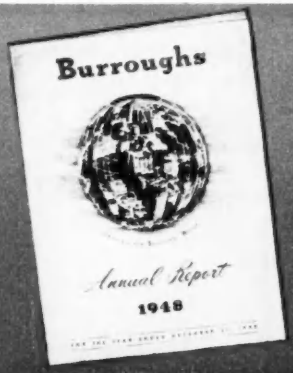
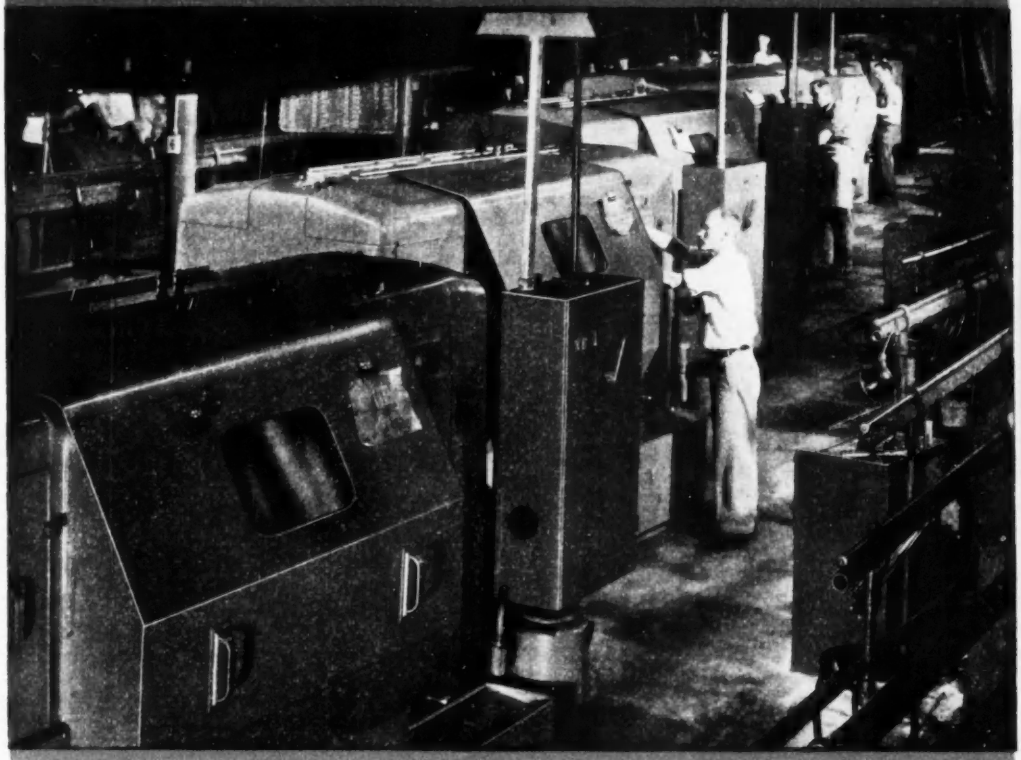


BETTER MACHINES *mean* GREATER EFFICIENCY AND HIGHER QUALITY



NEW BRITAIN MULTIPLE SPINDLE SCREW MACHINES PICTURED IN BURROUGHS 1948 ANNUAL REPORT AS PART OF THE COMPANY'S IMPROVEMENT PROGRAM.

In 1947 and 1948 Burroughs Adding Machine Company reinvested a substantial part of its earnings in major equipment, including some New Britain Automatics. The results of this reinvestment policy were higher quality of product, greater efficiency and better working conditions.

New Britains' high productive capacity makes them the world's safest investment. Those who fail to make the investment take the risk by endangering their ability to compete. May we send you "IT CAN BE DONE," a brochure of actual histories which includes detailed information on the work New Britains are doing for leading manufacturers?

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Clark Dealer Plan Achieves Both

WITH sales of its fork-lift trucks and industrial towing tractors exceeding all expectations, and with its position of production and engineering leadership firmly rooted in rich, productive soil, Clark Equipment Company, in its 30th year as a builder of materials-handling machines, has found it desirable to establish a nation-wide organization of independent franchised dealers as exclusive distributors of the products of its Industrial Truck Division.

THIS is indeed a far cry from 1939 when the entire output of the Industrial Truck Division was sold with ease by a handful of men!

TODAY'S volume is twenty times that of 1939; and the Company's stature—financial and engineering—is more than twenty times as great as in 1939. A considerable number of the '39 machines are in daily service, and many older machines are in regular operation after 20 and 25 years. The conviction is natural that 30 years hence many '49 machines will still be "on the job" alongside the new output of 1979. There will be no "orphans" bearing the name "Clark."

TO KEEP PACE with increasing demands, and to deliver the broad and competent service which Industry expects from Clark, the Company has chosen this plan of selling through independent dealers as a sound and logical evolution. Until the middle of 1948, approximately one-third of Clark's Industrial Truck Division representatives were on an independent dealer basis. It is expected that by the end of 1949 the nation-wide dealer organization will be complete.

HEADING up the dealerships or actively participating in them are key men of Clark's erstwhile factory-branch sales offices—factory-trained men, tested and proved as capable materials-handling counselors. These men share with Clark management the conviction that they can deliver, under the new plan, a broader and more valuable service to their customers and to all users of mechanized materials-handling; that they face broader, deeper vistas of opportunities which ambitious men so earnestly desire—opportunities for independence, for building greater earnings by their own efforts, for achieving prestige and leadership in their communities.

ANOTHER influence which furthered the plan is the fact that Clark management historically has been engineers and manufacturers. By decentralizing marketing activities, Clark can intensify its emphasis on development of better materials-handling machines and methods—to the end that Clark products shall achieve even higher excellence at lower cost, shall become still more valuable to industrial users and to the dealers who serve them.

THROUGH your Clark dealer, all the advantages of Clark engineering, integrated production and matchless experience are quickly available to you. He is fully qualified to make an unbiased appraisal of your materials-handling operations, and to recommend the type of machine that will serve you most efficiently at lowest cost. It's "good business" to CONSULT CLARK.

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INDUSTRIAL TRUCK DIVISION

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NEW YORK 6
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4 shows combustion chamber in the piston and a compression ratio of 16 to 1 for use as a Diesel or gas engine.

"B" is the single valve which seats against "C" the permanent cylinder head sleeve, "D" is an oscillating sleeve which is operated by rocker arm "J" and push rod, the cam being a natural eccentric. "L" shows the yoke around the cam and indicates that the sleeve is positively operated, hence not affected by speed of the engine. The valve "B" is also positively operated and stays full open during change-over from exhaust to intake.

The particular design shown at Figs. 4 and 5 are an adaptation for air-cooling where cylinder head "F" is a simple round casting without ports and "G" is a circular manifold insulated from the cylinder head and is the only hot area. There is no bleed back of heat from the exhaust to cylinder head. "H" is the intake manifold and is insulated from the exhaust, and being internally cooled does not require external cooling.

This design generally reduces the problems of air-cooling and makes possible an increase in compression ratio with air-cooling instead of a decrease.

Because the valve is alternately cooled and heated, the temperature of the valve head is less than half that of exhaust valves in present day engines. Disregarding for the moment what this does for the life of the valve it is clear what this lowered temperature does for the temperature of the mixture at the time of ignition. Since a degree saved at this time is equal to a drop of many degrees in the maximum flame temperature it is easy to see why this engine may have an additional anti-detonating latitude of 25 to 30 octane for vehicle engines. For aircraft engines the additional anti-detonating latitude will be greater since present aircraft engines with poppet valves have no anti-detonating qualities and depend on fuel and alcohol-water injection.

The second article in this series will appear in an early issue of AUTOMOTIVE INDUSTRIES.

Publications Available

(Continued from page 58)

prices on all Carboloy insert tools, including round, square, triangular and rectangular types.

D-9—Portable Electric Tools

Independent Pneumatic Tool Co.—All models in the new Thor Silver Line of portable electric tools are described and illustrated in a new circular. Specifications for the various tools are also included.

D-10—Automatic Locking Plugs

Russell & Stoll Co., Inc.—A new 12-page catalog features automatic locking Midget Ever-lok plugs, receptacles and

(Turn to next page, please)

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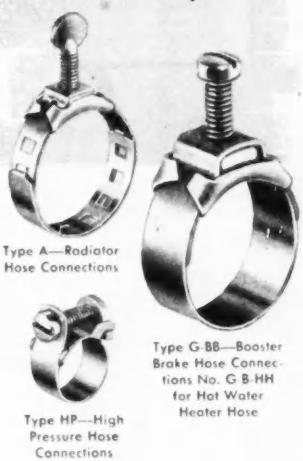
The Standard of the Automotive Industry



Type A—Radiator Hose Connections

Type G-BB—Booster Brake Hose Connections No. G-B-HH for Hot Water Heater Hose

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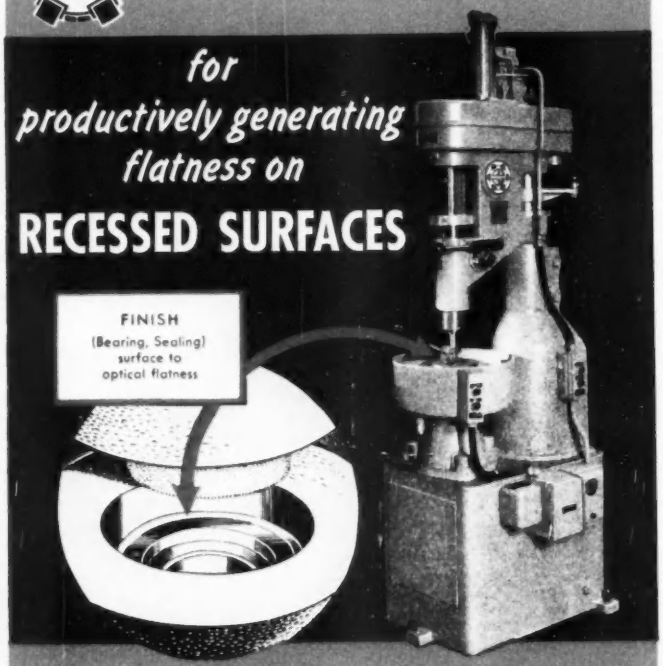

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cord connectors. Illustrations, dimensional drawings and ordering information are included in the catalog.

D-11—Air Valves

Gerotor May Corp.—A 20-page book on air valves illustrates and describes the various models which make up the complete line of Gerotor 4-way air valves. A description of each model valve includes working drawings, specifications for sizes, and cutaway views. The simplified design of the new air valves is featured.

D-12—Induction Motors

Electric Machinery Mfg. Co. — The ABC of Large Induction Motors, a 32-page issue of the E-M Synchronizer, covers the basic theory, operation, characteristics, and applications, and control of large induction motors. The booklet is well illustrated with photographs and cutaway views and has many graphs with explanatory figures accompanying the text.

D-13—Assembly Line Control

TelAutograph Corp. — A folder specially planned for the automotive industry illustrated and describes the part played by handwritten communications in smooth assembly line operation. Titled "Assembly Line Scheduling with Pen Point Accuracy" the folder gives information on the use of TelAutograph Telescribers in Body plant—assembly and inspection.

D-14—Motor Protection

Allis-Chalmers Mfg. Co. — The Inside Story of Allis-Chalmers Safety-Circle Motor Protection is a new 8-page bulletin describing the design and construction features of the Safety-Circle motor.

D-15—Broach Sharpeners

Colonial Broach Co. — Bulletin No. CS4-36 describes the Model CS4-36 Universal Broach Sharpener for both round and flat broaches. New machine features and operating details are included in the bulletin, together with a table of general specifications, operating data, lists of standard equipment and special equipment available.

Leyland to Erect New South African Plant

Leyland Motors, one of the biggest of England's truck manufacturers, is extending its South African policy of practical manufacture and assembly of trucks in that country. Mr. F. Grimshaw, general works manager, has just flown from England with designs for an assembly plant to be erected at Elandsfontein, Germiston, which will handle main units produced in the home factory. The company's present headquarters, offices and workshops at Cape Town will be rebuilt to handle the expected extension of business.

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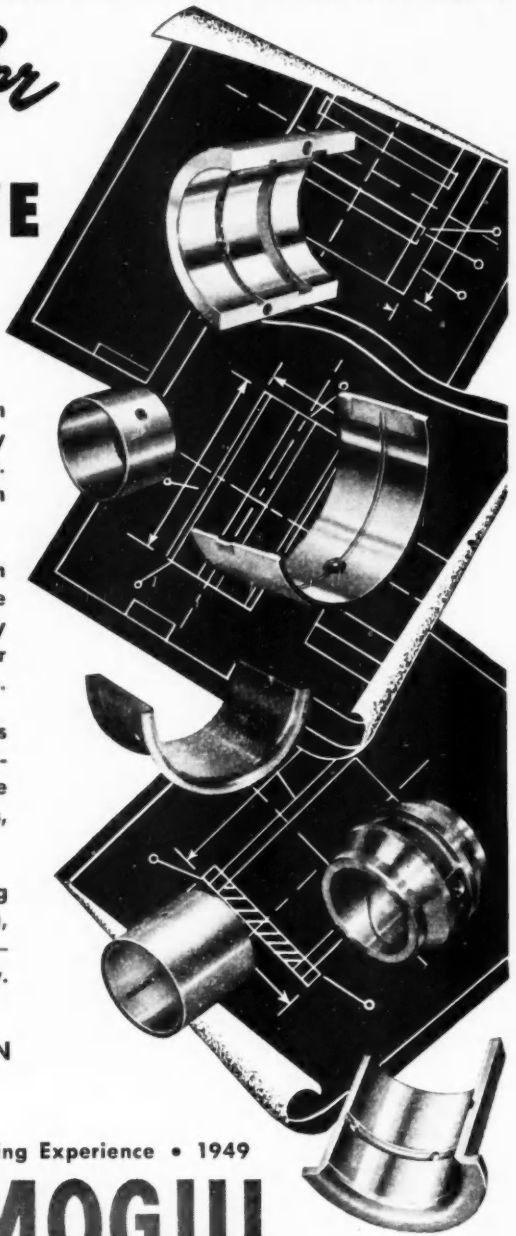

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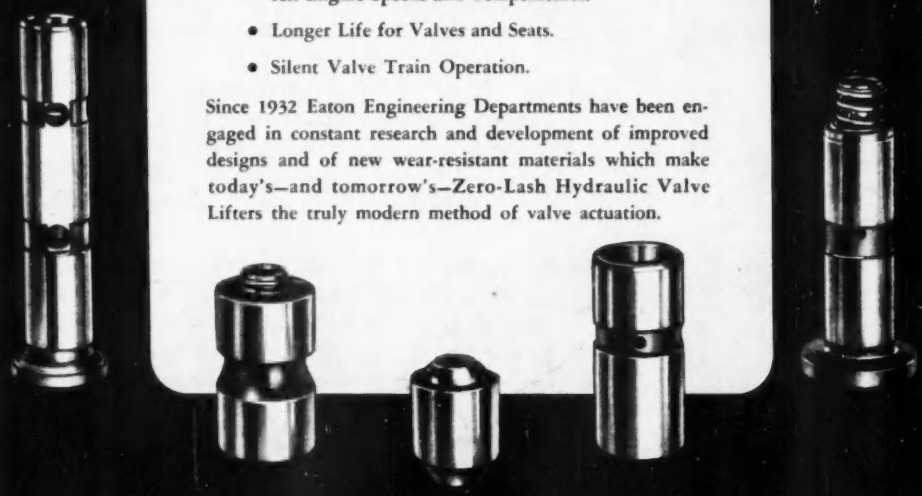

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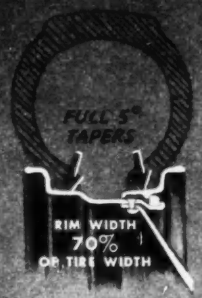

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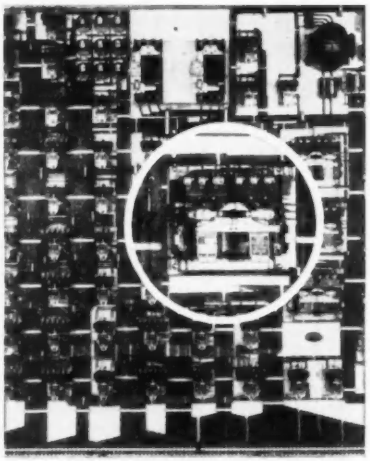
Wheels—Hub and Drum Assemblies—Brakes—"Vacdraulic" Brake Power Units—for Passenger Cars, Trucks, Buses—made by Kelsey-Hayes' 4 Michigan Plants and Windsor-Canada Plant • "Magdraulic" Electric Brakes—"Lathan" Vacuum Power Brake Equipment for Tractor-Trailers—made by Kelsey-Hayes' South San Francisco-Lathan Plant. Wheels—Hubs—Axles—Parts for Farm Implements—made by Kelsey-Hayes' French & Hecht Plant at Davenport, Iowa.

SNYDER *Machines Cost Less in the Long Run*

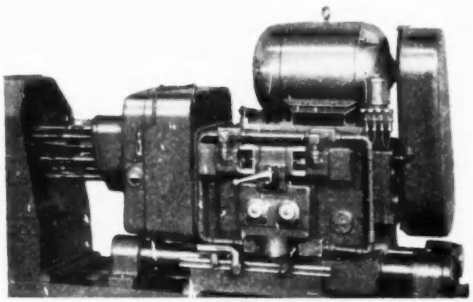


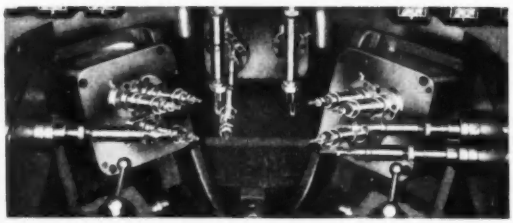
BEAUTY BY THE MILE

Maybe it isn't important that a control panel be beautiful except that in the case of Snyder panels the beauty is the result of the perfect orderliness of the layout. Every circuit can be traced, clearly and easily. Every cycle is protected, when desirable, by interlocks to prevent machine damage through electrical failure. Every panel is provided with manual operation for tool set-up. All conform to established standards. Miles of wire are set into the panels yearly, every inch with such precision and neatness that our panels are notably compact. Building these beautiful panels in our own shop makes us independent of outside delivery dates, gives us close coordination during building and testing each machine and enables us to deliver a better job that saves you money in the long run.

QUICK-CHANGE ARTIST

We think we've done an exceptional job on our standardized component units, used on most of our machines. All units, whether way or guide bar type, have hardened and ground bearing surfaces. They provide any required stroke up to 24", yet, create no problem of overhang on extended stroke, as do ram-type units. They are so adaptable and so well built that they can be re-tooled over and over again thereby delivering substantial savings in machine investment since retooling can give you an entirely different operation at minimum cost. Special units are designed with the same objective—to give you durability and versatility that will save you money in the long run.





YOUR TAPS ARE TOPS IN SNYDER SPINDLES

A good many years ago we satisfied ourselves that the individual lead screw type of tapping head is the most effective means of leading taps into the work and established it as our standard equipment. This method permits proper speed selection for each individual tap; produces a more accurate thread; eliminates the hazard of thread-stripping. Threads of the lead screw are precision ground after hardening. Snyder safety tap drivers are used exclusively to eliminate tap breakage. Lead screw tapping nuts are of the finest bronze and are replaceable. These features have satisfied the precision requirements of ordnance and aircraft work. They will satisfy you and save you money in the long run.

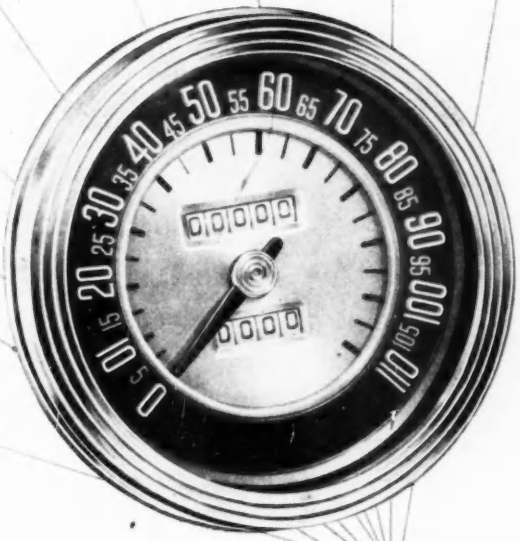
SNYDER

TOOL AND ENGINEERING COMPANY

3400 E. LAFAYETTE
DETROIT 7, MICHIGAN

24 Years of Successful Cooperation with Leading American Industries

A greatly improved speedometer by KING-SEELEY



OLD TYPE MAGNET

NEW, CUNIFE MAGNET

The performance, dependability and service life of an automotive speedometer depends primarily on its permanent magnet and the ability of that magnet to retain its initial strength under all operating conditions.

A new and much superior magnet is now being used exclusively in King-Seeley speedometers. It is made of Cunife, a very powerful magnetic material having unusual physical properties which has made possible an instrument of greater accuracy, dependability and longer life.

Specifically, this new Cunife magnet provides 30% more force with only two-thirds of the weight of the previous magnet. The new material has reduced bearing load 50% and is 750% more stable. It is far more resistant to temperature variations, vibration, shock and the effects of stray magnetic fields.

This is another result of King-Seeley's continuing research program which has for many years led the march of progress in the field of automotive instruments.

5038

KING-SEELEY *Corporation*

PLANTS IN • ANN ARBOR GRAND RAPIDS • YPSILANTI

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Exterior View of a Complete Mahon Finishing System Planned and Installed for the Coleman Company, Wichita, Kansas.

. . . an Investment in TOP EFFICIENCY and LOWER PRODUCTION COSTS!

Interior View on Ground Level Showing Mahon Hydro-Filter Spray Booths in Two Production Lines with Diffusers of Filtered Air Supply System Directly Above. Metal Cleaning and Rust Proofing, Spray Painting, and Dip Enameling Equipment are Located on the Ground Floor. The Filtered Air Supply System, Drying Ovens, Bake Ovens, Heating Units and Controls, and Recirculating and Exhaust Fans are located on the Second Floor Level.

Here, again, is a typical Mahon solution of a complex finishing problem...a complete self-housed finishing system planned from-the-ground-up, engineered and built by Mahon. A finishing system of this type, installed adjacent to manufacturing buildings, has many advantages . . . most important of which is freedom in planning, which results in 100% efficiency in production layout and equipment performance—all building restrictions and consequent compromises are eliminated, because the exterior housing is designed to fit the finishing system. The current trend in industry is toward this type of efficiently planned, self-housed finishing system to produce the finer sales-influencing finishes so important in marketing today. Where space adjacent to manufacturing buildings is not available, the complete system may be installed on the roof, in a court, or areaway. Remember, when you are contemplating new finishing equipment, that the Mahon organization has pioneered development in this highly specialized field for twenty-nine years . . . broad experience in every industry where finishing constitutes a major production operation, backed by constant research and experimentation, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere.

THE R. C. MAHON COMPANY

Home Office and plant, Detroit 11, Mich. • Western Sales Div., Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Rust Proofing Equipment, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, Drying and Baking Ovens, and Paint Reclamation Units. Also, Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

MAHON

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SPHER-O-HONED

YOU'LL AGREE . . .
THERE'S A BIG DIFFERENCE

Once you have used Bower Spher-O-Honed bearings you'll agree with the many who use them that here are truly outstanding bearings. They give consistently finer performance on every count. ★ Marked superiority is built into every Bower Spher-O-Honed bearing because of their basically different and greatly improved design—spherical roll-ends and flange surfaces, a large oil groove and higher cone flange—and because the most modern manufacturing technics are employed which produce micro-inch precision. ★ These are the significant advantages that explain the extra smoothness, longer life, and greater dependability of Bower Spher-O-Honed bearings . . . the big difference that makes them your best bearing buy.

For more complete information, write for the new Bower engineering catalog.

BOWER ROLLER BEARING COMPANY • DETROIT 14, MICHIGAN

BOWER

ROLLER BEARINGS

If you are using carburizing steels . . .

Here's where it pays to use U·S·S SuperKore Steels

In many applications like these	in which these steels are generally used	you will save money by using
Aircraft gears, shafts, pinions, etc.	E-3310, E-9310 or equivalent AMS Specification	U·S·S SuperKore A (AMS-6266)
Heavy duty truck and tractor gears, shafts, pinions, etc.	3316, 9316	U·S·S SuperKore AA
Heavily loaded gears, shafts, pinions etc. and carburized parts used in oil well drilling industry.	4815, 4820	U·S·S SuperKore B
Gears, shafts, pinions, etc.	4317, 4320	U·S·S SuperKore C

Cut your Costs with U·S·S SUPERKORE *steels*

● There's been a lot of talk lately about "dollar metallurgy." It's just a fancy name for metallurgical research that aims to give the steel user more for his money in the way of reduced costs and better product performance. If you want to know how it pans out in reducing the cost of gears, shafts, and pinions *subjected to heavy loads*, put U·S·S SUPERKORE Steels to work.

This is what you'll discover: You'll find that when SUPERKORE Steels are applied, where they should be, you can obtain the same high-core-strength-plus-toughness formerly obtainable only with more highly alloyed carburizing steels. But your costs for steel and your manufacturing costs will be less.

That is because our metallurgists had *lower-users'-costs* in mind when they set out to develop U·S·S SUPERKORE. Because SUPERKORE Steels are lower in total alloy content they cost less to start with. And because the alloying elements are used more effectively and the steels are further improved by special manufacturing practices, SUPERKORE Steels have improved carburizing characteristics. They have better machinability, and they are easier to anneal. Therefore they can be turned into superior finished parts at lower cost.

U·S·S SUPERKORE Steels are now available in four different grades —each designed for a *specific* type of heavy duty service. Find out where you can apply them to reduce your costs, to simplify inventory and specification details. To guide you in their most economical and practical application, the men who developed SUPERKORE will be glad to assist you. The "Superkore Booklet" will give you further interesting information. You can obtain a copy by writing to Carnegie-Illinois Steel Corporation, Room 2070 Carnegie Building, Pittsburgh 30, Pennsylvania.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
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COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

9-319

UNITED STATES STEEL

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Can Relax and Rest Easy

...when their costs are fastened down... and sales speeded up... by AMERICAN PHILLIPS SCREWS

VACATION FROM COST-WORRY: Assembly costs are controlled ... *fixed and held as much as 50% lower than you ever saw them before* ... when old-fashioned slotted screws are replaced by modern, power-driven American Phillips Screws, the *only* screws with the crossed, *cornerless* recess. Production and product-quality go up as worker-fatigue goes down. And profits flourish as rejects and spoilage all but vanish.

VACATION FROM SALES-WORRY: Customers *don't* like bungled fastenings with ugly, marred surfaces and broken screw-heads that snag clothes. And that's exactly why they *do* like American Phillips-fastened products ... because every fastening is cleanly made and attractive to look at, with never a burred head to spoil sales-appeal. So fasten *your* product with American Phillips Screws... *and help yourself to double profits.*

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

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we offer . . .

The AUTOMOTIVE INDUSTRIES Editorial Index covering all issues from January 1, 1949, to June 15, 1949, Inclusive

The 20-page AUTOMOTIVE INDUSTRIES Editorial Index, to be issued soon, saves hours of searching for specific subjects covered in past editions, and comes in 8½"x11" size for easy filing.

It provides you with a quick summary of ALL the editorial articles, listed alphabetically by subject, along with page numbers and dates of the issues in which they appear. Also includes a cross-index by author and company mentioned.

Printing of the index will be limited, so order your copy now by enclosing check or cash for 50 cents, with the coupon below. If, at the same time, you wish to order the index for the next 6-months' issues (July 1 to December 15, inclusive), enclose $1.00. It will be sent upon publication.

Mail coupon today to Editorial Department

AUTOMOTIVE INDUSTRIES

Chestnut & 56th Sts.

Philadelphia 39, Pa.

Please send me the new AUTOMOTIVE INDUSTRIES Editorial Index covering the 12 issues from January 1 to June 15, 1949, inclusive, for which I enclose 50¢. (I would also like to order the next 6 months' index, both for $1.00, which I enclose). Forward index to:

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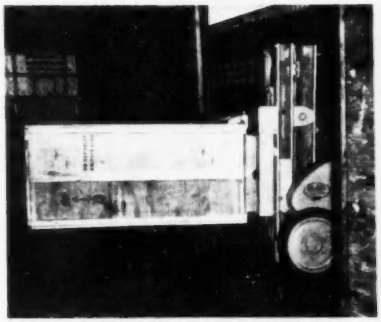
AMAZING NEW SKYLIFT CRATE-CLAMP DEVICE MOVES AND STACKS BULKY CRATES *WITHOUT PALLETS OR FORKS!*



In order to utilize all available space in box cars, the top tiers of crates can be placed horizontally. Clamp attachment is capable of handling in either vertical or horizontal position.

Raising load as he enters car, operator makes sharp right angle turn for positioning of top tier against side of car. As the car is loaded near the doorway, the operator can pull away from the tier immediately without maneuvering, since there are no forks to be withdrawn from beneath the load.

As load is moved into position, side shifting feature of attachment moves load laterally without the necessity of additional maneuvering. Such "jockeying" is often time consuming and, therefore, costly.

SAVES INDUSTRY THOUSANDS OF MAN-HOURS

Cuts loading and unloading Costs More Than Half!

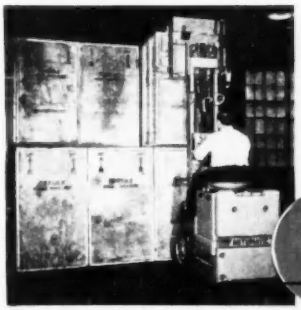
Entirely eliminating the need for forks or pallets in handling large bulky crates, a hydraulic clamp attachment applied to an Automatic Skylift Fork Truck, simply and easily grasps the top, bottom, side or end of crate, securing it firmly for carrying and stacking.

This crate clamp device, with side-shifting feature and push-button control, is an integral unit equipped with separate hydraulic pump and motor, rams, valves, fittings, etc. It is coupled only to the truck's electrical system, and is easily removed to substitute standard forks.

As can be seen by the pictures, this SKYLIFT Fork Truck with clamp is extremely maneuverable, can make sharp right angle turns, easily negotiates steep bridge ramps into box cars, lets operator load car right up to doorway.

The same ease with which operator loads car, is experienced in tiering in storage, as side-shifting feature is utilized to position load accurately.

With the clamp device for handling bulky crates, or in the regular model for moving and stacking any kind of product on pallets, Skylift pays big dividends in money and human energy saved, can cut your handling costs more than half. Mail coupon for complete facts. There is absolutely no obligation.



With a 4" lateral movement either right or left of center, or a total of 8 inches, accurate spotting becomes immediate, and easy, as operator merely pushes the electric control button.

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ELECTRIC TRUCKS
A PRODUCT OF AUTOMATIC
Lighten LIFE'S LOADS

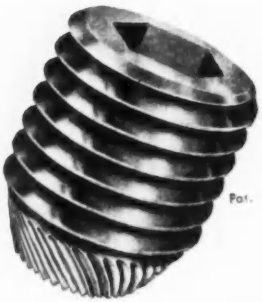
AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE YALE AND TOWNE MFG. CO.
57 West 87th Street, Dept. K-9, Chicago 20, Ill.
Please mail me, without cost or obligation, complete facts on your Skylift with Clamp Device, and free catalog.

Company Name.....

By.....*Position*.....

Street Address.....

City.....*Zone*.....*State*.....



UNBRAKO

SELF-LOCKING SET SCREWS

"... they won't shake loose!"

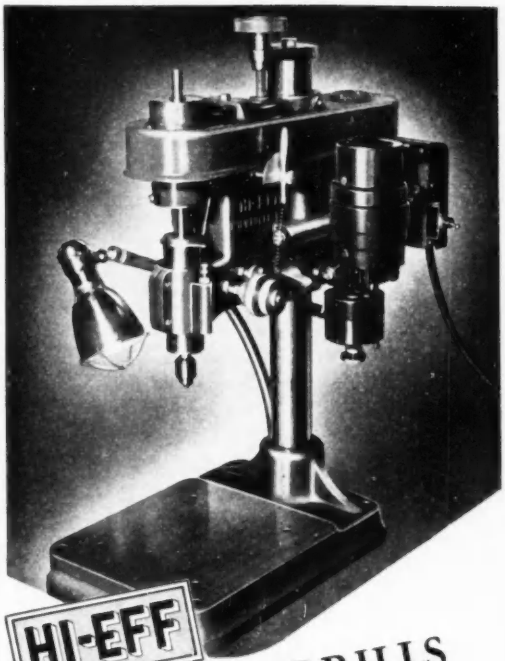
Machine failure from any cause is expensive — in downtime, repair costs, lowered production, poor deliveries and loss of customer goodwill. Frequently such failure is caused by the loosening of set screws holding vital machine parts together.

UNBRAKO *Self-Locking* Set Screws won't shake loose! Their exclusive *knurling* makes them exceptionally vibration-resistant, prevents "creep" and subsequent loosening of the screws. They "stay put", even under the most chattering vibration.

UNBRAKO *Self-Locking* Set Screws can be real "Vibration Insurance" for *your* production machinery. And remember, they make an impressive selling point when you use them on your finished products.

Our folder 658-1 gives you further details. Write for yours today!

SPS STANDARD PRESSED STEEL CO.
BOX 611, JENKINTOWN, PENNSYLVANIA



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SENSITIVE DRILLS

Holes Down to .002" Diameter
Speeds Up to 40,000 R. P. M.

It requires HI-EFF precision to hold a fast running drill to close tolerances. With the combined run-out of spindle and chuck held within .0001", drill life is longer, scrap losses fewer. For positive lubrication and freedom from vibration, spindle and spindle pulley bearings run in a vapor-like cloud of oil. To provide the correct speed for each operation, standard models of the HI-EFF Series "A" Drills have a speed range of 800 to 10,000 R.P.M. in steps of 100 R.P.M. (Special models range up to 40,00 R.P.M.)

Designed and constructed for super-sensitive drilling, HI-EFF drills are performing efficiently and economically on production lines, in tool and instrument rooms. If you have a high precision drilling job, for hole sizes .002" to ⅛", write for details. (Also available are HI-EFF Series "B" Drills for holes .010" to ⅝".)

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As it does not dry out, it remains in condition on work indefinitely, hence saves the scraper's time. Intensely blue paste can be spread thin; transfers clearly. 50¢ per tube. 45¢, 2 or more. Ask your dealer, order from this Ad, or write for FREE Trial Tube!
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A steady flow of production . . . *when* you want it.
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Busy people choose
THE PITTSBURGHER HOTEL
In the heart of Pittsburgh's Golden Triangle . . . near the important office buildings, stores and theatres.
JOSEPH F. DUDDY, Manager
A Knott Hotel

Classified Advertisements

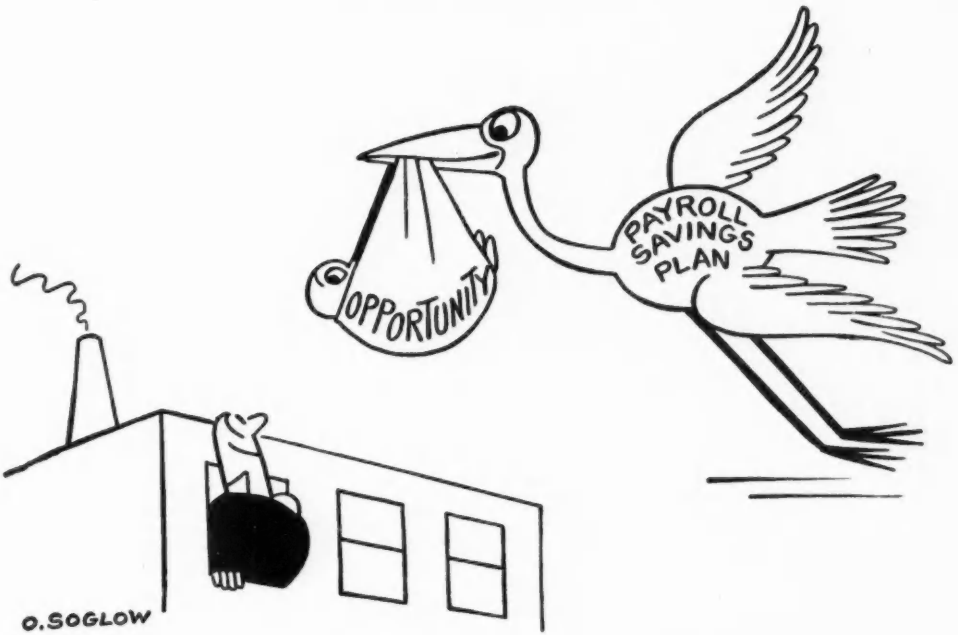
MANUFACTURER—If you are a manufacturing supplier to the automotive, aviation or refrigeration industry and desire competent and experienced representation at Wright Field and in Dayton, Ohio, and surrounding cities, the writer would appreciate the opportunity of personal discussion and contact. Box 67, AUTOMOTIVE INDUSTRIES, 5601 Chestnut St., Philadelphia 39, Pa.

ENGINEER AVAILABLE—Research and development engineer with 25 years experience in new product and process development in mechanical, electrical and plastics fields, available Sept. 1. Prefer Mississippi Valley location. Box 68, AUTOMOTIVE INDUSTRIES, Chestnut & 56th Sts., Philadelphia 39, Penna.

FOR SALE—Thor Pneumatic Nut Setters. Two, 14ND, 5/16 in.; Model 4845; 450 RPM. Condition excellent. Priced new, $190.00. Price $60.00. Mr. Warner, Liberty Planers, Inc., Hamilton, Ohio.

Thor Hy-Cycle Tools. All 220 volt, 180 cycle, excellent condition.
15 screwdrivers, A-15, 3/16 in., Model 4891; 475 RPM; Priced new, $190.00. Price $17.50.
5 nutsetters, A-17, 2/16 in., Model 4927, 1000 RPM. Priced new, $100.00. Price $17.50.
5 studsetters, like above. Mr. Warner, Liberty Planers, Inc., Hamilton, Ohio.

AUTOMOTIVE INDUSTRIES
Penetrates into Leading Plants in the Automotive and Aircraft Industries



Put more opportunity into your company's future

WITH THIS FIVE-STEP PROGRAM

Here's an easy-to-follow program that will substantially increase your company's chances for a prosperous future.

Nation-wide experience in 20,000 companies proves that this popular program also pays off handsomely *today*. It increases each participating employee's peace of mind—making him a more contented, more productive worker. It reduces absenteeism, lowers accident rates, increases output, and improves employee-employer relations!

This program is simply a proved formula for building membership in the Payroll Savings Plan—the "automatic" system by which millions of workers are investing in U. S. Savings Bonds every pay-day.

What Are the Five Steps?

The benefits of the Payroll Savings Plan to your company are in proportion to the percentage of employees who participate. Nation-wide experience indicates that 50% of your employees can be persuaded to join *without high-pressure selling*. Here are five steps which have proved to be the "magic formula" for putting over the Plan. They will get results for you:

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.

4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Check up on the Payroll Savings Plan in your company. If fewer than half of your employees are participating, you have a lot to gain by following the five-step program outlined here. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division. While it's on your mind, why not call him right now? Or write the Treasury Department, Washington 25, D. C.

Are You With It?

In the current national Savings Bonds campaign, May 16-June 30, the Treasury Department asks each company operating the Payroll Savings Plan to canvass all employees, with the goal of having at least half of them signed up by the end of the month. This advertisement tells how you can achieve that goal most easily.

The Treasury Department acknowledges with appreciation the publication of this message

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

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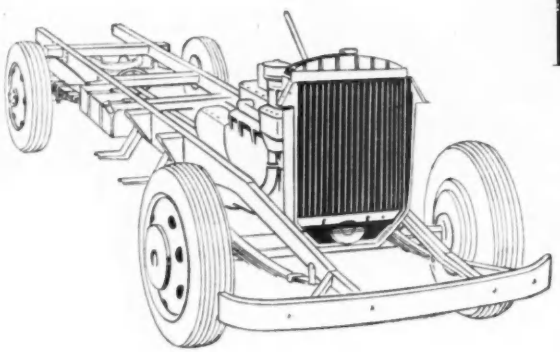

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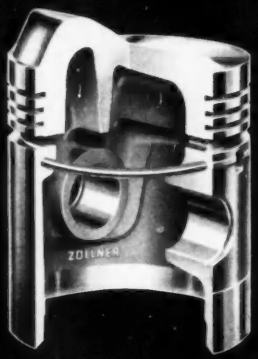

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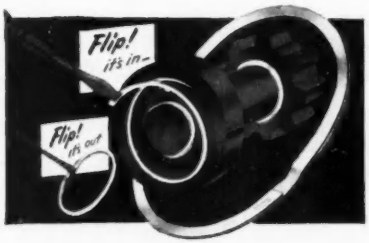

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